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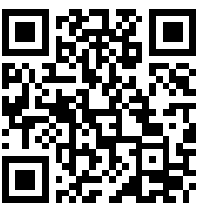

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THE RAILWAY MAGAZINE.]

GLASGOW-ABERDEEN RESTAURANT CAR EXPRESS, CALEDONIAN RAILWAY.

5 P.M. EX BUCHANAN STREET, NEAR GLENBOIG.

PICKERSGILL THREE-CYLINDER SUPERHEATER 4-6-0 LOCOMOTIVE No. 956.

(From a Photograph by Henry L. Salmon.)

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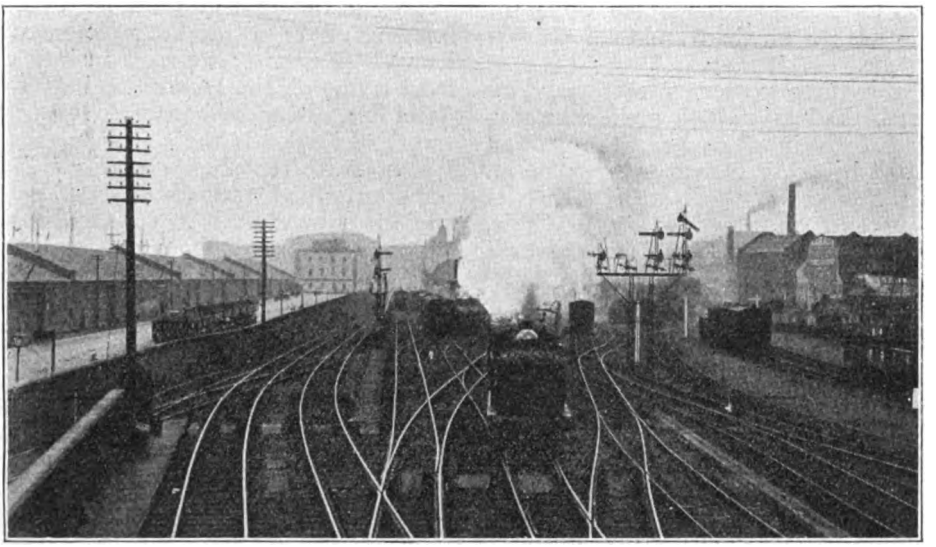

Photo.] CAMPERDOWN JUNCTION, DUNDEE. [*J. F. Gairns.*

Dundee Harbour premises to left; incline from Dock Street tunnel and Tay Bridge station, North British Railway, in centre; Dundee (East) station and goods yard to right. Caledonian Railway local train on Dundee and Arbroath joint line approaching.

Dundee as a Railway Centre.

RANKING as the third largest city in Scotland, and a big industrial and manufacturing centre, Dundee is served by an important series of lines, while its chief passenger and goods stations deal with traffic on a large scale. Moreover, the inter-relations between the Caledonian and North British Railways, and with the Dundee and Arbroath Joint Railway (managed and worked jointly by the two companies mentioned), and the lines of the Dundee Harbour authorities, include many interesting features.

The two principal stations, Tay Bridge, North British Railway, and Dundee (West), Caledonian Railway, and their respective goods depôts, both of large extent and dealing with considerable traffic, are all in line fronting upon South Union Street, close to the western end of the harbour and dock premises. The North British goods station is separated only from the River Tay by the fine esplanade which extends as a riverside walk as far as Esplanade station, at the north end of the famous Tay Bridge, and for some distance beyond. Tay Bridge passenger station is of through type, but the North British goods and the Caledonian goods and passenger stations are all terminal and on road level, except that from each goods depôt there is a surface track crossing public thoroughfares adjacent on the level, by which wagons are transferred by means of horses, and occasionally by locomotives as complete trains, to and from the Harbour lines, while goods and other traffic proceeding through between north and south of Dundee passes through Tay Bridge passenger station.

Harbour traffic is, however, chiefly dealt with by means of the North British main line through Tay Bridge station, and thence via Dock Street tunnel, from which trains ascend to reach the surface at Camperdown Junction, just beyond the Dundee (East) station of the Dundee and Arbroath Joint Railway, continuing for some distance alongside Harbour premises and making connection with the railway tracks of the Harbour area. This route is used by the Caledonian Company also for goods, and occasionally passenger

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traffic, proceeding through to north of Dundee via Buckingham and Camperdown Junctions.

Of the three passenger stations, Tay Bridge is the least notable architecturally, in that it is in a cutting, the station buildings being directly upon the platform, with the offices of the Northern District Commercial Superintendent, Mr. J. Wilkie, above. At road level, therefore, there are only suitable entrance ways. The Caledonian station, Dundee (West), on the other hand, has a notable block of buildings, including the offices of the District Traffic Superintendent, Mr. D. W. Barrie, and with an ornamental clock tower to give it further distinction. Dundee (East), the terminus of the Dundee and Arbroath Joint Railway, is also somewhat notable, as it has a good frontage, and an overall arched roof. Of the three, however, Tay Bridge station is the busiest, in that it is a through station, the principal stopping place on the North British main line between Edinburgh and Aberdeen, whereas the Caledonian Railway serves Dundee by means of the branch from Perth, other lines being of a local character, while Dundee (East) is concerned mainly with local traffic on the Dundee and Arbroath Joint line. In addition to main line traffic, too, Tay Bridge is the centre for several North British traffic routes, and has important local services. Furthermore, while it is purely a North British station, a number of Caledonian goods trains and light engines from and to the Caledonian engine sheds use the North British lines from Buckingham Junction via Tay Bridge station and Dock Street tunnel to obtain access to Caledonian and Joint line routes north of Dundee. Both companies also work goods trains to the Dundee Harbour lines via the North British station and tunnel instead of, or additional to, the surface connections already mentioned.

The general lay-out will be gathered from the plan of Tay Bridge and West stations on pages 4 and 5. Other aspecst of the traffic are brought out in the series of articles which follow.

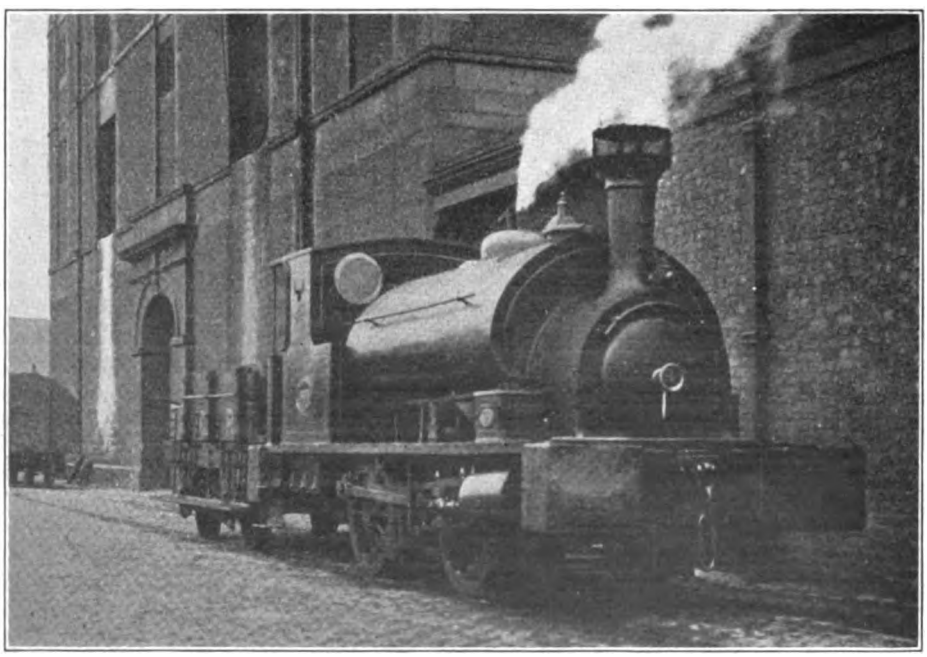

Photo.] [*J. F. Gairns.*

CALEDONIAN RAILWAY 0-4-0 SADDLE TANK ENGINE, WITH SHUNTERS' BRAKE VEHICLE, IN SERVICE ON THE DUNDEE HARBOUR TRUST LINES.

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SOUTH EXPRESS LEAVING TAY BRIDGE PASSENGER STATION.
4-4-0 Superheater Locomotive, No. 419, "Talisman."

I.—TAY BRIDGE STATION, NORTH BRITISH RAILWAY.

By J. F. GAIRNS.

TAY Bridge passenger station is in a cutting, between massive stone walls separating it on the one side from the North British goods depôt and on the other from the Caledonian goods station, while all station premises are located on one large island platform. Correctly, the station lies south-west and north-east, but for convenience and clearness the terms north and south will be used, in view of the general character of the traffic directions.

At the north end is a stairway connection with South Union Street, the main access when the station was an open one, with the booking offices on the platform, and still principally used by ticket holders and for exit purposes. From South Union Street a thoroughfare curves round alongside the station to the goods depôt. Several covered gangways lead from the roadway to the station, one giving access to the parcels' office, one leading to a hoist for the transfer of luggage, &c., to and from the platforms, and also to a staircase for passengers passing to and from the station, and a third giving access to the District Commercial Superintendent's offices.

A new booking office has recently been erected at street level, enabling passengers to book before passing on to the platform, thus enabling the station to be "closed," platform tickets being issued to anyone desiring to see passengers off or to meet arrivals.

The station proper consists only of one island platform, 476 yards long, serving the up and down main lines, and with two terminal bays at the south end. The platform is fairly wide, but is curved; there are through up and down goods lines outside each platform line. At the north end the railway at once enters Dock Street tunnel, the four through lines becoming two virtually at the platform end, so that shunting movements, and the changing

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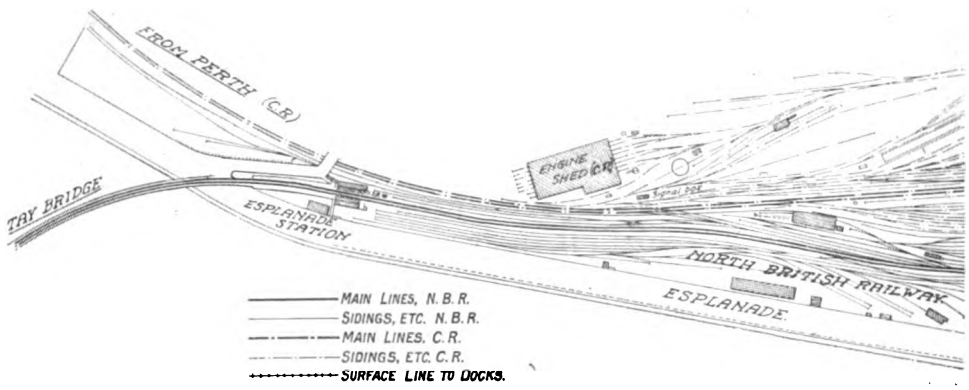
of engines on down through trains, require entrance to the tunnel on a sharp curve.

At Buckingham Junction, connection is made with the Caledonian Railway, so that goods trains and light engines for service on the Joint line and north of Dundee can use the North British line through Tay Bridge station and the tunnel.

South of Buckingham Junction the North British station known as Esplanade is reached. This is used to a certain extent, but many trains, even of a local character, do not call here, while it has lost its one-time importance as the ticket-collecting station south of Dundee. This station curves sharply on to the famous Tay Bridge. On the Fife side is a junction leading on



PLAN OF TAY BRIDGE AND WEST PASSENGER AND

the one hand to Wormit passenger station, served only by trains towards Tayport, thence via the coast line to Leuchars Junction, and the main line direct to St. Fort (where the Newburgh and North Fife Railway diverges) and Leuchars Junction, for the St. Andrews and Fife Coast line.

North of Tay Bridge station, after passing through the tunnel, trains ascend by a fairly steep gradient between Dundee (East) station and the Dundee Harbour premises, and from Camperdown Junction use the Dundee and Arbroath Joint Railway to Broughty Ferry and Arbroath.

Tay Bridge station, though all offices are concentrated upon one long island platform, is well served from the public point of view. Entering from the Union Street stairway, a postal pillar box, tobacco, fruit and confectionery stalls and a bookstall may first be noted. In the first block of buildings are provided a platform booking office, guards' rooms, &c., and the stationmaster's public and private offices. The next block includes stairways from the new booking office, luggage hoists, &c. Another block, distinguished by a large projecting clock on the down side, includes public telegraph office, left luggage office, first and third-class refreshment and dining rooms, and ladies' waiting room. Next is a stairway to the district offices above, and beyond are staff rooms, other waiting rooms, &c.

Traffic is controlled by three signal cabins under the charge of the Tay Bridge stationmaster; East box, 32 levers, at the north end, under the Union Street bridge, West box, 52 levers; and Central box, 72 levers, controlling connections with the goods station and with the Caledonian Railway. Esplanade station and Tay Bridge north signal cabins are also under the charge of the Tay Bridge stationmaster. Signalling is mechanical, except that electric lamp repeating signals are used in Dock Street tunnel, various adjuncts, including repeaters and track circuit, being installed in view of the complex movements often called for, and the difficulties of observation.

About midway along the down side of the platform is a crossover from platform to through line, worked by levers in a recess in the platform buildings, with signals to correspond, but this is rarely used now in view of the length of the

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principal main line trains. At the south end all platform lines as well as the up through line are signalled for departing and shunting movements.

In view of the fact that Dundee has only minor importance as a holiday and tourist centre, it is not surprising to find that the principal train services apply all the year round, the main line trains being in constant request for journeys by business people, while many of the local services are provided mainly to meet the requirements of Dundee people who reside in the many attractive places within a few miles' radius. The following are the principal through trains in the down direction :—

5.32–5.38 a.m. through sleeping car express from King's Cross to Dundee and Aberdeen, including also through carriage from Penzance and Plymouth via Swindon, Leicester and Sheffield.

9.23–9.31 a.m. through sleeping car express from King's Cross and St. Pancras to Dundee and Aberdeen, including sleeping car and through carriage from King's Cross detached at Dundee, and with breakfast car from Edinburgh.

11.51–11.57 a.m. restaurant car express from Edinburgh to Dundee and Aberdeen, with through carriage to Elgin.

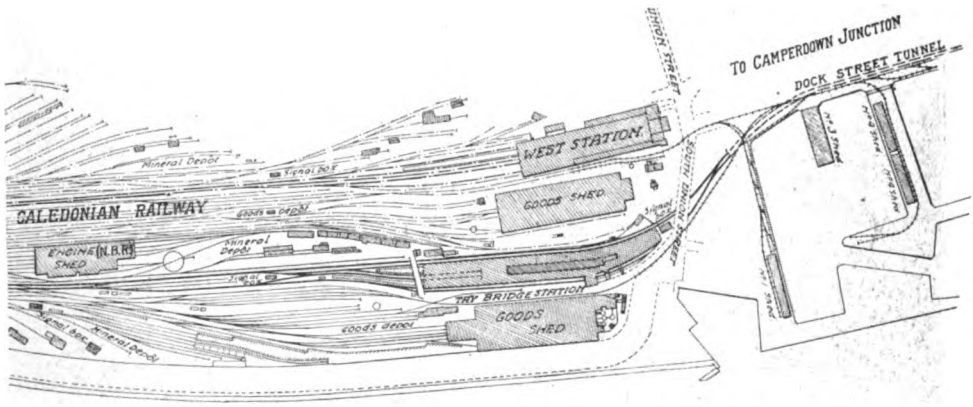
3.41–3.47 p.m. restaurant car express from Edinburgh to Dundee and Aberdeen.

8.25–8.31 p.m. restaurant car express, with through carriages from King's Cross and St. Pancras for Dundee and Aberdeen.

Owing to certain restrictions in regard to traffic between Dundee and Arbroath over the joint line, most of these trains do not convey intermediate traffic between those places and Broughty Ferry, where a call is made at that station on a conditional basis. There is also a through train from Edinburgh (4.25 p.m.), dealt with at Dundee 6.23–6.32 p.m., which works through as a semi-fast between Edinburgh and Aberdeen, and at 5.20–5.25 p.m. a train from Perth at 4.10 p.m. continues through from south of Dundee to Arbroath. Otherwise, all local traffic north of Dundee is worked from Dundee (East) station.

In the up direction principal main line trains are as follows :—

8.4–8.9 a.m. restaurant car express from Aberdeen and Dundee to Edinburgh, with through carriages for King's Cross and St. Pancras.



GOODS STATIONS AND CONNECTIONS AT DUNDEE.

11.39–11.45 a.m. through restaurant car express from Aberdeen and Dundee to Edinburgh and King's Cross, conveying also through carriages for Plymouth and Penzance via York, Sheffield, Leicester and Swindon.

2.44–2.50 p.m. restaurant car express to Edinburgh with through carriage from Elgin.

5.27–5.33 p.m. through semi-fast express to Edinburgh.

7.37–7.43 p.m. restaurant car express from Aberdeen and Dundee to Edinburgh, with through carriages for St. Pancras and connecting with sleeping car express thereto from Edinburgh; also with sleeping car and through carriage attached at Dundee for King's Cross.

8.59–9.4 p.m. through restaurant car express for Edinburgh with sleeping cars

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and through carriages from Aberdeen and Dundee to King's Cross.

There is also a through semi-fast train from Arbroath at 9.5 a.m., connecting with a train from Montrose, dealt with at Dundee 9.44–9.50 a.m., for Edinburgh, and a local train from Arbroath at 6.32 p.m. to Dundee (Tay Bridge), in advance of the 7.37–7.43 p.m. sleeping car express.

In the summer months there are slight alterations, in that the 8.47 a.m. from Glasgow (Queen Street), due at Tay Bridge Station via Tayport at 12.4 p.m., follows Penzance, and having restaurant car accommodation from Edinburgh. In the opposite direction, the corresponding train is the 3.10 p.m. from Aberdeen, Dundee 4.55–5.4 p.m., with restaurant car accommodation to Edinburgh and through carriages to St. Pancras.

On routes south of Dundee a considerable number of trains are concerned. In fact, between Dundee and St. Andrews, both via Tayport and direct to Leuchars Junction via St. Fort, there is quite a heavy suburban traffic, not only into Dundee in the mornings and home in the

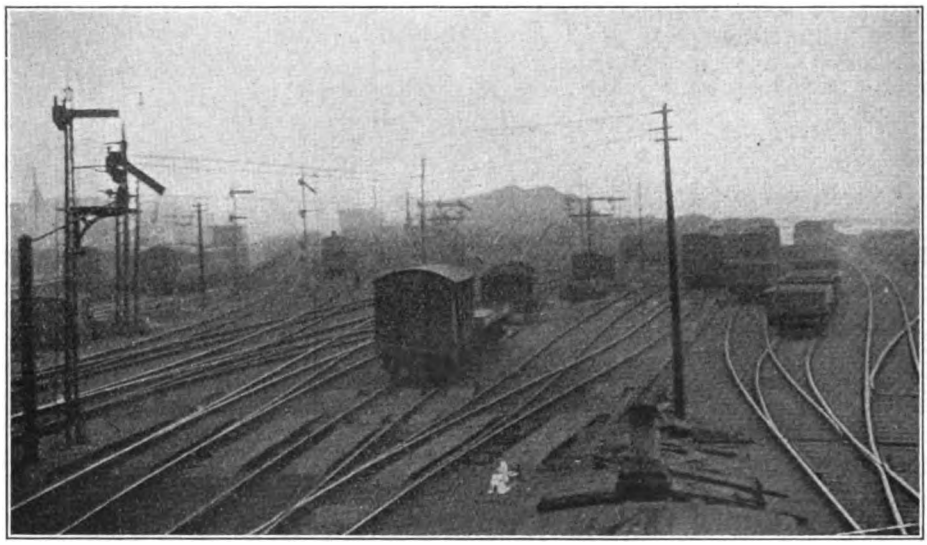

Photo.] BUCKINGHAM JUNCTION, DUNDEE. [*J. F. Gairns.*

North British incline from Tay Bridge passenger station, left centre: Tay Bridge goods yard and depôt, North British Railway, to right.

the through express just before noon as a semi-fast train to Arbroath, and the train from Edinburgh due at 3.13 p.m. is extended to Arbroath and Montrose, while in the opposite direction the 3.5 p.m. up train from Dundee to Edinburgh starts from Arbroath, and an additional train is provided from Montrose at 7 p.m. and Dundee 7.44–8 p.m. as a through sleeping car express from Montrose to King's Cross in place of the sleeping cars ordinarily attached to the 7.37–7.43 p.m. train at Dundee.

On Sundays the only down through train is the 7.40 a.m. from Edinburgh (Waverley), conveying sleeping cars from King's Cross, the through carriages from

evenings or on Saturday afternoons, but also at the midday period, in view of the fact that many Dundee business people use their season tickets to go home for the midday meal. School children also travel in considerable numbers to and from the schools of Dundee, while some travel from Dundee and intermediate stations to St. Andrews, which is a scholastic centre, as well as the headquarters of the "Royal and Ancient Game of Golf." People from neighbouring stations also travel to Dundee in considerable numbers for shopping and evening entertainment purposes. Thus, from Tayport, trains serving intermediate stations are due at Tay Bridge station at 6.45, 7.43, 8.38, 8.52 and 9.41 a.m. and

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from St. Andrews at 8.44, 9.13 and 10.8 a.m., there being also a train from Newburgh and the North Fife line at 8.58, besides several main line trains which provide for residential traffic into Dundee. Similarly, there are departures from Tay Bridge station, suitable for Saturday afternoon or midday lunch traffic, at 12.49, 1.0, 1.52, 1.57 and 2.15 p.m., and later in the afternoon at 4.40, 4.55, 5.17, 5.33, 5.54 (except Saturdays), 6.15, 6.24, 7.14 and 7.20 p.m. Throughout the day there are also reasonably frequent trains on most of the local routes, as well as

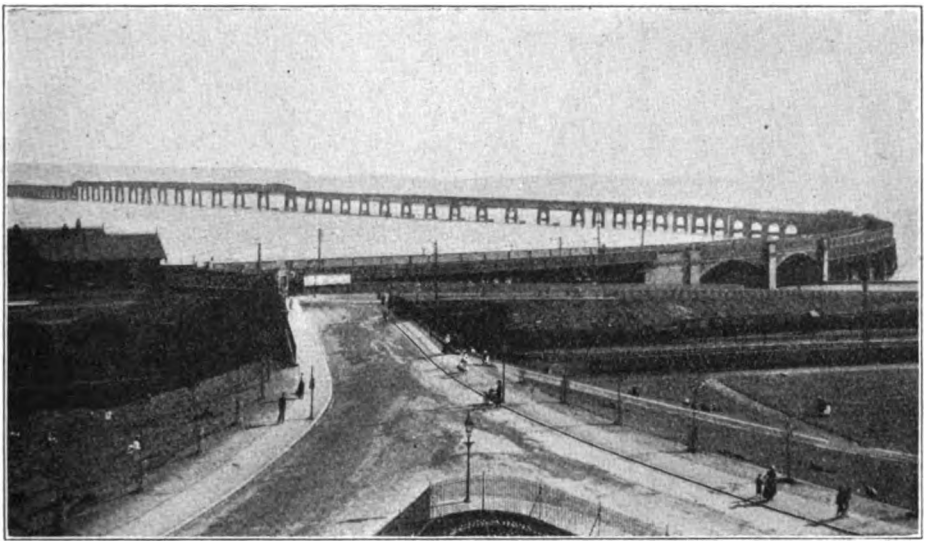

Photo.] **THE TAY BRIDGE.** *[J. Valentine & Sons.*

Showing also Esplanade Station, North British Railway, and Caledonian lines to Perth on low level.

evening trains as late as 10.45 p.m. for Tayport, and a Saturday through train at 10.5 p.m. for St. Andrews.

At reasonably frequent intervals there are stopping main line trains from Dundee to the South, and several which proceed via St. Andrews and the Fife Coast line to Edinburgh or Glasgow, notably the 7.56 a.m. and 2.15 and 4.55 p.m., and the northbound trains due at Dundee at 10.8 a.m. and 12.30 and 8.41 p.m. In the aggregate, therefore, Tay Bridge station has to deal with a considerable number of passenger trains, those which proceed through requiring to change engines and sometimes to attach or detach vehicles, while when groups of trains are concerned it is sometimes necessary to use all platforms to accommodate trains ready for departure. In addition, as already indicated, a large number of through goods and mineral trains are run. The North British Company provides a frequent service of through goods, mineral and live-stock trains run daily from Tay Bridge station to Montrose, Kirriemuir, Forfar, Arbroath and Aberdeen, with connections to all parts of the North of Scotland, while a similar service is given in the southern direction to the Fife coal fields, Glasgow, Edinburgh, South Leith, Portobello and Bathgate, as well as to Tweedmouth and Carlisle, the latter trains giving direct connections to all parts of England and Wales. There are also passing through Tay Bridge station Caledonian trains working through over the North British line and Caledonian light engines to and from that company's engine sheds at Dundee (West) via Buckingham Junction.

Mr. James Henderson has for some years been stationmaster at Tay Bridge station, his jurisdiction extending from Harbour Junction, north of Dock Street tunnel, to Esplanade station, which is also under his oversight. He is assisted at Tay Bridge by two station inspectors, three clerks, two station foremen (with a third during the

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summer months), six ticket examiners and three carriage shunters (with one additional in each case during the summer), 16 porters (with two or three others during the summer period), two carriage lamp men and one signal lamp man. Mr. Henderson also has control of traffic working in the North British Tay Bridge goods depôt alongside, in which connection he is assisted by three yard inspectors, and six yard foremen, with porters and shunting staff as required. Fifteen signalmen cover the duties at Tay Bridge East, West and Central boxes and Tay Bridge North, with two train record lads employed in the West box. Five relief signalmen for the district are also attached to Dundee. Under Mr. Henderson's jurisdiction are also 13 passenger guards, 41 goods guards, and a load examiner whose duty it is to examine the loads of night trains passing through Tay Bridge station before crossing Tay Bridge.

The booking and parcels staff is under Mr. J. Cockburn, and includes five booking clerks (one additional in summer), six parcels clerks and ten parcels porters; also two cloakroom attendants.

About 280,000 tickets are taken by passengers at Tay Bridge station in the course of twelve months, these including considerable numbers purchased by Dundee business men travelling to London, Liverpool, Manchester and principal towns in England and Scotland. There are also nearly 6,000 season and traders' tickets issued from Dundee, though the larger proportion of season tickets available at Dundee is naturally issued from the residential stations north and south. Besides ordinary season tickets, workmen's weekly tickets are issued between Tayport and Newport and Dundee.

In view of the heavy industrial traffic, the North British goods depôt is necessarily of considerable extent. A neat range of offices is provided as Union Street curves round to join the Esplanade, Mr. Alex. Boyd being in charge as goods agent. His staff includes 50 clerks, the wages staff, consisting of porters, checkers, loaders, &c., being about 80. Cartage is performed by two firms under contract terms. The main goods shed is 404 ft. long, and includes the usual inwards and outwards platforms served by five roads connected by traversers, each road having a capacity of 25 wagons. Hydraulic cranes include one of three tons capacity on each platform, and 10 of 25 cwt. capacity. The platforms are wide, and

MR. J. HENDERSON.
Stationmaster, Tay Bridge, Dundee, North British Railway.

MR. A. BOYD.
Goods Agent, Tay Bridge, Dundee, North British Railway.

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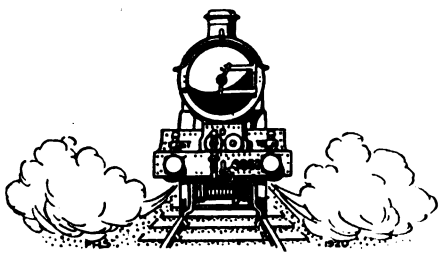
arranged so that road vehicles can be backed as required to ensure a minimum of manual transfer of goods. There is also an outside loading bank having tracks on either side, and at its outer portion a third road is let into it, the bank here being higher than elsewhere so that loads can be tipped directly into the railway wagons, a protecting rail being provided to prevent road vehicles being moved over the edge of the platform. The combined capacity is 60 wagons. The cattle bank is double-sided, and 16 wagons can be dealt with simultaneously. The middle yard contains eight sidings for 40 wagons each. The grain store accommodates about 250 tons. A 20-ton crane is provided in the yard.

Average monthly statistics of goods traffic dealt with at the North British goods depôt and in the yard and coal sidings attached are: outward loaded wagons, 3,387, representing a tonnage of about 8,000; wagons received for unloading, 3,468, tonnage 10,000; coal, 1,900 wagons, 16,000 tons. Goods traffic includes large quantities of flax, hemp and tow; finished yards, Hessian cloth as used for the manufacture of linoleum, sacking, tarpaulins, carpets, oakum, also raw jute, and other materials required by the staple industries of Dundee, together with large tonnages of finished and semi-finished products. Machinery figures to a considerable extent, while there is a large export traffic in marmalade and preserves, confectionery and sweets, whisky, &c., and an important general traffic in groceries and sundries, oil, potatoes, &c. As a shipping centre, there is also heavy traffic in shipbuilding material and in ships' supplies.

North British goods traffic to and from the Dundee Harbour premises is also under the general oversight of Mr. Boyd. Apart from the Harbour staff there are about 12 shunters, these being provided year by year alternately by the Caledonian and North British Railways. When the North British Railway is responsible, these men are under the control of the Tay Bridge stationmaster. The District Commercial Superintendent, Mr. J. Wilkie, who is located at Dundee, has oversight of the whole of the northern district in regard to commercial aspects, the operating side being under Mr. D. McRobbie at Burntisland.

We are indebted to Mr. J. Wilkie, Northern District Commercial Superintendent, and Mr. D. McRobbie, Northern District Operating Superintendent, and their staffs, for material assistance in regard to the compilation of this article, and to Mr. Henderson and Mr. Boyd, as concerned directly with Tay Bridge passenger and goods traffic, for information and general assistance rendered in regard to their respective departments.



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II.—DUNDEE (WEST) STATION, CALEDONIAN RAILWAY.

By CHARLES TRAVIS, M.Inst.T.

THE Caledonian Railway Company possess excellent facilities in the Dundee area for handling both goods and passenger traffic. While their goods station at Dundee (West) is, like most Scottish goods stations, somewhat unpretentious in appearance, this deficiency is more than compensated for by the individuality of the passenger station, which is built in a style generally characteristic of Caledonian practice. The two are situated alongside each other, the passenger station immediately facing Union Street, Whitehall Crescent, Dock Street and the harbour, and the goods station, which is built on reclaimed ground, lying between the passenger station and Tay Bridge station, North British Railway.

Dundee (West) passenger station was built in 1889, and is admirably equipped for dealing with its extensive local and through traffic. The station buildings have a two-storey frontage to Union Street, and, as will be noted from the accompanying general view, present a most pleasing appearance. The District Traffic Superintendent of the Caledonian Railway for Dundee and district, has his headquarters at this station, the district offices extending the full width of the building on the first floor—or " one stair up," to use the usual Scottish equivalent.

The booking hall is a lofty apartment, the booking office itself having a semi-circular front facing the main entrance, while access to the circulating area is afforded to passengers through passages on either side of the booking-office. The parcels office is situated to the right of the main entrance and the telegraph office to the left. In the circulating area, which was recently doubled in extent, is a well-arranged train information board, giving clear indication of the time and platform of departure, this being located in full view of passengers as they enter the station. There is also a commodious book-stall, together with a fruit and confectionery stall for the convenience of the travelling public.

The passenger station essentially comprises two main platforms, each with a bay line, three tracks being interposed between the two main platforms and serving Nos. 2 and 3 platform faces, two tracks being to the left of No. 1 platform and ending in a bay, and one track to the right of No. 4 platform similarly ending in a bay. It may also be noted in connection with the track arrangement that a double line turns out from the main tracks slightly in advance of the station and runs between the passenger and goods stations, converging into one track prior to crossing South Union Street for the purpose of serving the various harbour lines. The four passenger platforms are used for both arriving and departing trains, and it may be added that the station is supplied with an admirable suite of rooms and offices, consisting of stationmaster's office, left luggage office, waiting rooms, first and third-class refreshment rooms, guards' and porters' rooms, &c., these being extended along the southern side of the station between the circulating area and No. 1 platform bay line.

The through traffic dealt with at Dundee (West) is largely with Preston, Manchester, Liverpool, Crewe, and the west of England, and London and the south, and is considerable, while the traffic with Glasgow, Edinburgh, and the south and west of Scotland is likewise heavy. There is also an extensive volume of local traffic with Perth, Gleneagles, Crieff, Blairgowrie, Coupar Angus, Alyth, &c., and the residential services between these places, as also the suburban services in the Dundee area, are largely utilised. Through coaches work regularly between Dundee (West) and Carlisle, Preston, London (Euston), Glasgow (Buchanan Street), Balquhidder and Crieff.

The stationmaster is Mr. Salmond, who has been at Dundee since May, 1912, and under his supervision the station staff, which numbers 90, comprises 3 inspectors, 13 clerks, 5 ticket examiners, 11 passenger train guards, 16 goods train guards, 42 porters, &c., &c. The signalling at the station is entirely mechanical, while facilities are provided for locomotive

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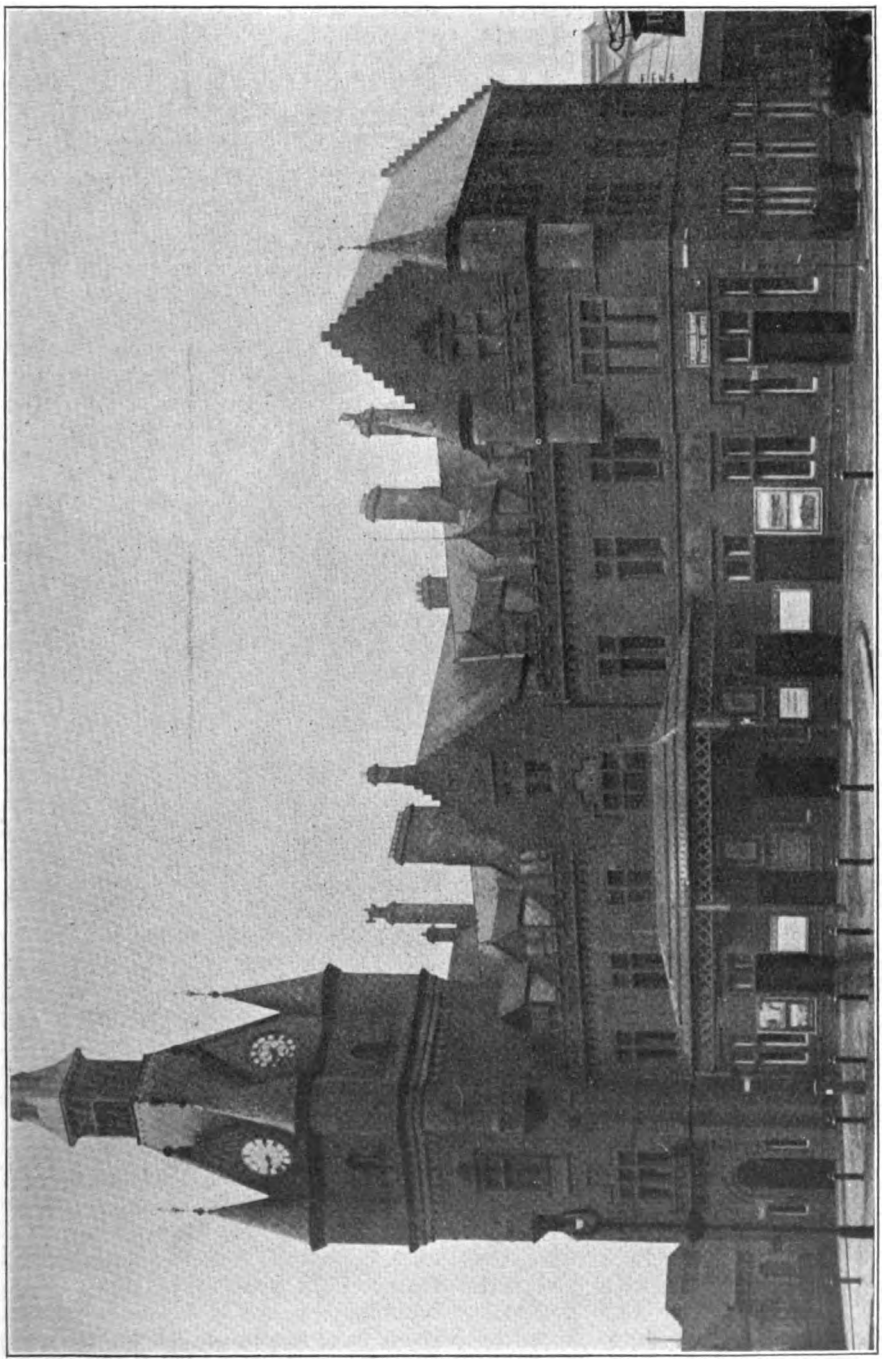

DUNDEE (WEST) STATION, CALEDONIAN RAILWAY.

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maintenance at the engine shed situated some distance beyond the station yard.

The Caledonian goods station at Dundee (West) handles a heavy and important traffic, principally comprising jute goods, preserves, whisky, groceries, potatoes, machinery, iron and steel. A considerable volume of traffic also passes to and from Dundee Harbour. In all, the goods station and associated sidings occupy an area of about 10 acres, standing accommodation being provided for, approximately, 750 wagons. The goods shed, which is a two-storey building, has two platform roads and a middle road and accommodates 90 wagons at one time. A further 105 wagons can be provided for in the yard and as 44 wagons can also be handled at outside loading banks, one to the left of the shed and the other in the yard, each platform face taking 22 wagons at one time, 239 wagons may be accommodated at one time in the station proper. Mineral traffic is dealt with in a group of sidings to the right of the goods shed, where provision is made for the standage of 450 wagons of coal and rough goods traffic. Of this number, the east mineral yard with eight sidings accommodates 138 wagons and the west mineral yard 306 wagons. The total mineral traffic dealt with in these sidings averages 15,000 tons per month.

The goods yard is arranged on a well designed plan, an extensive circulating area being provided between the entrance to the stations and the goods shed, while wide cart-ways extend the full length of the shed on either side. It may incidentally be mentioned that the bulk of the cartage vehicles, both at Dundee (West) and other Caledonian stations, berth alongside and not end-on the bank. On inquiry as to the reason, it was elicited that in their experience this is the most convenient method of loading and unloading. The goods offices immediately face the entrance to the yard and comprise the old headquarters of the Dundee and Newtyle Railway company, an interesting line which has received adequate attention in the pages of the RAILWAY MAGAZINE. The goods shed platforms are equipped with two 3-ton and eight 30-cwt. hydraulic cranes, supplied by Armstrong, Whitworth, Limited, and are of the low jib type.

Three wagon traversers and capstans are provided to facilitate the movement of wagons in the shed. These are constantly in use to meet the needs of the working. The traversers will transfer all clases of wagons except rail, timber, twin, gondola, and passenger train vehicles, from one side of the shed to the other. There is also a 15-ton hand crane in the yard. The store, situated over the goods shed, has an area of 1,125 sq. yards and is capable of holding about 1,000 tons of traffic. Two 1-ton hydraulic cranes are provided for the raising or lowering of traffic, this being effected through hatchways opening on to the rails between platforms in the goods sheds, and also through hatchways affording access to the roadways facing the north and south goods platforms inside the shed.

Speaking generally, the traffic handling methods adopted at Dundee follow the best practice, and it may be noted that, although it is not the case at all Caledonian goods stations, the numerical system of loading is in operation at Dundee (West). Under this method, the wagons set for the reception of outwards traffic are given a progressive number instead of being indicated by the name of the destination station, this number being clearly shown on the wagon side. The checker then chalks the appropriate number for the particular destination station on the package for the guidance of the truckers, who are thus directed to an easily identified position. The numerical system has the further advantage of enabling the loader more readily to check the packages, and it is stated that, since the adoption of this system, the loading operations associated with outwards traffic have been accelerated very considerably.

In view of the great importance rightly attaching to the average loading of wagons, this phase of working is specially supervised by the agent, and an inspection of the figures showing results obtained indicate that the average figure is satisfactory. In view of the fact that fully 65 per cent. of the traffic handled at Dundee (West) comprises sundries of a miscellaneous character, frequently involving a large number of consignments, each comprising many light packages, the "cost of handling" figure is a reasonable one; it is, in fact, not too much to say that it is one of the best I have encountered.

Including mineral traffic, the traffic handled at this station in normal times

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aggregates about 30,000 tons per month, mineral and ordinary freight traffic being fairly evenly divided. The total number of invoices made out each month is about 9,000, with approximately 20,000 entries, while the inwards documents range around 6,500 with roughly 19,000 entries. In a normal week between 6,000 and 7,000 wagons are dealt with, this figure including traffic from and to the docks.

While I was at Dundee I learned that a considerable reduction had been effected in the claims expenditure, the number of claims having been reduced about 40 per cent. in the course of 18 months. This improvement is the outcome of various causes. First, a claims commission was appointed some time ago to investigate the handling of traffic generally over the Caledonian system, and the recommendations made by that Commission and carried into effect have no doubt been responsible to some extent for the improvement; secondly, an analysis of the claims paid at Dundee (West) is made periodically, and where damage or loss is taking place consistently on traffic for a particular district, steps are taken to locate the cause; thirdly, instructions are from time to time issued by the agent to his staff in regard to the proper methods of loading traffic, and personal visits to the traders for the purpose of urging upon them the importance of adequate packing of their traffic has also contributed to the decrease in claims expenditure.

The station is served by an extensive shunting yard to and from which the Newtyle branch, Fairmuir and Maryfield branch lines are served, and a little to the west there is an exchange junction with the North British Railway at Buckingham Junction, where a heavy traffic, particularly coal from Fife coalfields, is handed over by the North British to the Caledonian Railway. An important goods traffic is also exchanged between the two companies at this point.

MR. W. SALMOND,
Stationmaster, Dundee (West), Caledonian Railway.

MR. A. PATON,
Goods Agent, Dundee (West), Caledonian Railway.

The carting arrangements at Dundee (West) are typical of those in operation at many other Caledonian stations. The railway company turns out a certain amount of cartage strength, and the cartage contractors, Messrs. Wordie & Company, supply the balance required. To quote figures, it may be said that the railway carting section turn out 34 single and three pair-horse teams, while the cartage contractors employ between 60 and 70 horses on railway work at Dundee, some at the East but most at the West station. To accelerate the despatch of delivery traffic it is the practice at Dundee for strength to be provided from 4 a.m.

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to unload sundry traffic from wagons arriving overnight and to load lorries and place them in position for lifting. This enables about 40 vehicles to be ready by 8 a.m., and represents a distinct advantage in connection with the delivery work. The City of Dundee is divided into 14 cartage districts, and it is usual for calls to be made in the morning and during the afternoon.

The whole of the work at Dundee (West) goods station is in the charge of an agent, Mr. Alexander Paton, who has been at Dundee since October 1, 1919, and before that was at Stobcross station, Glasgow. Mr. Paton is well known as a keen student of transport matters.

The staff numbers 172, the clerical grades absorbing 50, and the operating personnel including 1 foreman, 2 assistant foremen, 19 checkers, 11 loaders, 34 porters, 13 shunters and 42 carters.

It may be added as an indication of the working efficiency realised at Dundee (West) that a very favourable figure is recorded in weight handled per man hour, while the cost of working is comparatively low.

The District Traffic Superintendent is Mr. D. W. Barrie, O.B.E., and it is owing to his courtesy and the kind permission of Mr. R. Killin, C.B.E., Superintendent of the Line, and Mr. J. Ballantyne, O.B.E., Chief Goods Manager, that I am enabled to write this brief description of the facilities offered in Dundee by the Caledonian Railway Company.

III.—DUNDEE (EAST) STATION, DUNDEE AND ARBROATH JOINT RAILWAY.

THIS station, located alongside the harbour, is about half-a-mile from the Tay Bridge and West stations. The North British line from Tay Bridge station, on emerging from Dock Street tunnel, ascends on a fairly steep gradient, and at Camperdown Junction connection is made with the lines from Dundee (East) station, the route continuing as the Dundee and Arbroath Joint Railway. The Dundee and Arbroath Railway Company was incorporated in 1836, and opened from Arbroath to Craigie, about two miles east of Dundee East, on October 6, 1838. In 1839 the railway was brought about a mile nearer to Dundee, and on April 1, 1840, the terminus at Dundee (East) was reached. This extension was actually built by the Dundee Harbour Trustees, alongside whose premises the

Photo] [*J. F. Gairns.*

DUNDEE (EAST) STATION, DUNDEE & ARBROATH JOINT RAILWAY.

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line runs for some distance, but was leased to the railway company, this arrangement continuing until 1907. The branch from Broughty Ferry to Broughty Pier was authorised in 1846. For many years this extension was utilised by train services to and from Dundee in connection with the North British ferry steamers between Tayport and Broughty Ferry, the only through route from the south possessed by the North British Company until the first Tay Bridge was opened, and perforce again from December, 1879, until the present Tay Bridge was brought into use in 1887. There is no need to consider the history of the Dundee and Arbroath Railway in detail, and readers may be referred to Mr. C. E. S. Littlejohn's article thereon in the September, 1909, number of the RAILWAY MAGAZINE. It may be mentioned, however, that the line was originally of 5 ft. 6 in. gauge, the conversion being made in 1847; that traffic was interchanged with the Dundee and Perth (now Caledonian) Railway from the West station by means of horse traction along the surface and dock lines, referred to in introduction, from 1847, a method which is occasionally used still; that for two distinct periods the Dundee and Arbroath Railway was leased to the Caledonian Company or its constituents, and that on February 1, 1880, it became the joint property of the Caledonian and North British railways, the latter having, in view of the completion of the first Tay Bridge, acquired a joint interest in the undertaking by virtue of the North British Act of 1879.

The Dundee and Arbroath Joint Railway was for a number of years managed by a committee of the two owning companies, and had its own managing staff, with headquarters and Secretary in Dundee, but since 1910 it has been managed and supervised by the officers of the owning companies.

Maintenance is under the direction of the owning companies, while locomotives and rolling-stock in respect of the Dundee and Arbroath local trains are provided by each company on the basis of equal services, taking into account the fact that the North British also uses the line for its train services to and from places beyond the Joint Line, and Caledonian Forfar trains use part of the route. Both companies are concerned in goods and mineral traffic, including that to and from Dundee Harbour premises, alongside which the railway runs for some distance, and with which several connections are made.

Dundee (East) station has a good frontage, well displayed by the wide open area adjacent to it, one of the principal entrances to Dundee Harbour being here provided. There are two main platforms under an arched overall roof, with a centre road between, and with bay lines on the outer sides of each main platform. As already mentioned, locomotives and rolling-stock are provided by each of the owning companies, the trains being usually worked by tank engines. They are all of a purely local character, and call at most stations between Dundee and Arbroath, except for the Caledonian trains to Forfar, which diverge from the Joint line at Broughty Ferry Junction. The greater part of the local traffic with places east and north of Dundee is concentrated upon the Joint line, there being quite a frequent train service either to Arbroath or to Carnoustie, 10½ miles from Dundee. There is, in fact, a heavy residential traffic from and to Broughty Ferry, Monifieth, Barry Links and Carnoustie stations, all in considerable favour with Dundee business people for residential purposes. For the morning traffic into Dundee (East) there are ten trains between 6.35 and 10.0 a.m.; on Saturdays nine trains leave between 12.7 and 2.10 p.m.; and for the ordinary homeward traffic there are ten trains between 4.0 and 6.15 p.m., and reasonably frequent trains thereafter until 10.50 p.m.

Associated with Dundee (East) station is a goods depôt, where goods traffic to and from the northward and eastward directions is mainly dealt with, and there are also several connections with coal yards and the premises of private firms. For some distance from Dundee (East) the line is crossed by several level crossings and footbridges giving public access to the dock premises alongside.

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THE RAILWAY PORTRAIT GALLERY.

Photo.] [*Claude Harris.*

MR. S. A. PARNWELL,

General Manager, Great Eastern Railway.

MR. S. A. PARNWELL, appointed General Manager of the Great Eastern Railway, in succession to Sir Henry Thornton, received his training in outside circles, until joining the Surveyor's department of the Great Northern Railway. In January, 1909, he was appointed Land Agent to the Great Eastern Railway. In connection with the staff re-organisation of 1915, Mr. Parnwell was appointed Assistant to the General Manager and Land Agent. On the death of Mr. P. Lomas, in December, 1916, Mr. Parnwell became Secretary and Comptroller. During the absence of Sir Henry Thornton on war service Mr. Parnwell was, in October, 1918, appointed Acting General Manager, and on Sir Henry Thornton's return, became, in July, 1919, Assistant General Manager.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

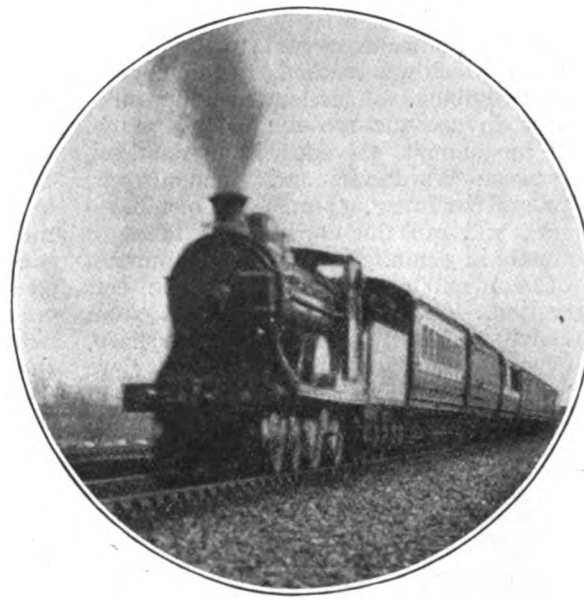

Photo.] [*A. B. MacLeod*

CALEDONIAN RAILWAY.
West Coast Express near Rockcliffe.
4-4-0 locomotive No. 141.

IT is with more than usual pleasure that I set out this month to deal with locomotive performance north of the Border. In the first place, it has fallen to my lot to make 18 journeys to Scotland during the past year, during which I have made a point of revisiting practically all the lines over which express running is performed; and, in the second place, I have been fortunate enough to record several feats of singular merit. Clearly it will not be possible to include in the limited confines of this article a description of all the runs timed, which cover over five thousand miles of travel; still less will there be room for the numerous running experiences with which various Scottish correspondents have favoured me in recent months. But I wish to concentrate more particularly on routes to which, through lack of data, but little attention has been devoted in these articles in previous years, and, in some cases, no attention at all. In pursuance of this policy, we will commence with a journey over the Great North of Scotland main line from Aberdeen to Huntly and back, made with the aid of facilities kindly granted for the purpose by Mr. G. Davidson, the General Manager of that Company.

The train selected for the outward journey was the 8.5 a.m. from Aberdeen to Inverness, at a date shortly before the restaurant car commenced to run in this service; the load behind the tender consisted of 33 axles of mixed bogie and six-wheeled stock, weighing 186 tons empty, and, with a good complement of passengers and luggage, 200 tons full. Superheated 4-4-0 No. 52, *Glen Grant*, was the engine. The start out of Aberdeen is not easy, with ¾-mile at 1 in 62, and a mile at 1 in 119–160 to Woodside, followed by 2¼ miles steepening from 1 in 276 to 1 in 100, and the 6¼ miles out to Dyce took 12 min. 5 sec.; thence, the seven level miles to Kintore were run in 8 min. 40 sec., with a maximum of 53 m.p.h., and the 3½ miles on to Inverurie stop in 4 min. 40 sec.—total 16¾ miles, allowed 25 min., in 25 min. 25 sec. The 3¾ miles from Inverurie to Inveramsay, mostly rising at 1 in 300 to 250, took 6 min. 25 sec., allowed 6 min. From Inveramsay to Insch the 13 min. allowance for seven miles includes some hard climbing; we accelerated up the ¾-mile at 1 in 100 from the start to 33½ m.p.h.; at Pitcaple we increased to 45 on the easier 2 miles between there and Oyne, and with a subsequent fall up 2½ miles averaging 1 in

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121 to 36½ we recovered to 45½ before Insch, which was reached in 13 min. 5 sec. Still climbing, we accelerated up 4½ miles at 1 in 200–102–100–142 to 36½ m.p.h. at the summit, 52½ miles from Aberdeen, between Wardhouse and Kennethmont, passed the latter, 5¼ miles, in 9 min. 40 sec., and ran the remaining 3 miles to Gartly in 3 min. 35 sec., with a maximum of 64½ m.p.h., gaining ¾-min. on this section. The booking of 7 min. from Gartly to Huntly, 5 miles, is very sharp, even allowing for the falling gradient; we took 7¼ min., again with a top speed of 64½ m.p.h. There was a slight loss of ½-min. against the engine over the journey, but this was recovered by exceptionally smart station work.

It was on the 11.20 a.m. out of Huntly that I made my return journey—a train distinguished by the longest daily non-stop run and the fastest start-to-stop booking on the Great North of Scotland system, as the 40½ miles to Schoolhill Ticket Platform at Aberdeen are covered without intermediate halt in 51 min. After the initial climb to Wardhouse Summit, however, the road is mainly with the engine. On this journey we had a 36-axle train, weighing 194 tons empty and 210 tons full, and hauled by another superheated 4-4-0, No. 45, *George Davidson*. Between Huntly and Gartly, passed in 9½ min., we attained 41½ m.p.h. on the easier part of the ascent (mostly about 1 in 200, with short intervening level strips); minimum speed on 1¼ miles at 1 in 100 was 32 m.p.h., and Wardhouse, 9¾ miles, was passed in 17¼ min.

Speed was not allowed to rise high on the succeeding descent to Inveramsay, on account of its winding character; the maximum was 67 m.p.h. at Pitcaple, and there were severe slacks through Insch, Oyne and Inveramsay. The 3½ miles from Wardhouse to Insch took 3 min. 35 sec.; the 7 miles on to Inveramsay 7 min. 35 sec.; the 3¾ miles from there to Inverurie 3 min. 35 sec.; the 3½ miles from Inverurie to Kintore 3¾ min., and the 7 miles thence to Dyce 8¼ min.—most of this distance was run at 53½–55 m.p.h., but there was a perceptible "easing" through Dyce—then speed again rose to a maximum of 61 m.p.h., and the 4¾ miles from Dyce to Kittybrewster were covered in 5 min., the stop at Schoolhill being effected in 50¾ min. It is significant that the 29½ miles from Wardhouse to Kittybrewster, over a route not usually associated with high speed, were run in the smart time of 31¾ min., all slacks included,

Photo.] GREAT NORTH OF SCOTLAND RAILWAY. [*W. Watt.*

3.30 p.m. Aberdeen-Elgin train passing Kittybrewster. 4-4-0 locomotive No. 104.

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at an average speed throughout of 55·8 m.p.h.

Having now returned to Aberdeen, the next thing to do, in geographical sequence, is to consider the North British service to Edinburgh by the East Coast route—a journey which I was enabled to make in both directions with the use of facilities kindly given by Mr. J. Calder, General Manager of the North British Railway. The south-bound journey was of really extraordinary interest. Since superheating, the work of the Reid "Atlantics" of the North British Railway has improved almost out of knowledge, and it is necessary to see them at work amid the peculiar difficulties of their own territory—both this route and the Waverley route—fully to appreciate their outstanding capabilities. It was on the 7.15 p.m. combined dining and sleeping car express out of Aberdeen that I travelled, and when I found 4-4-2 No. 868, *Aberdonian*, ably driven by John Kennedy, of Dundee, at the head of a 53-axle train—three 6-wheelers, five 8-wheelers and four 12-wheelers—weighing 330 tons empty and 350 tons with passengers and a substantial complement of luggage, I made certain that we should require assistance up the fearfully difficult starts out of Aberdeen, Stonehaven and Montrose. Not a bit of it! Beyond slight slipping at Stonehaven and Montrose, the engine tackled the banks in wonderful style, never appearing short of steam, and in the majority of cases, where speed was not being well maintained, accelerating consistently from the bottom nearly to the top of each incline. What this involved is best realised by a study of the profiles of these ascents, reproduced on the next page, in conjunction with details of the speeds achieved, which appear below.

A short ascent at 1 in 96 begins practically at the platform end at Aberdeen;

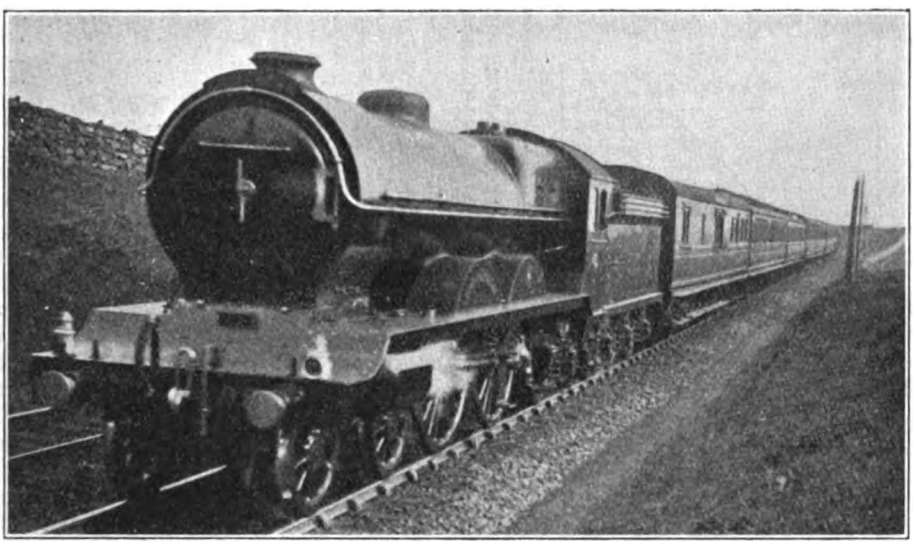

Photo.] NORTH BRITISH RAILWAY. [*Henry L. Salmon.*

9.50 a.m. Aberdeen-Edinburgh Restaurant Car Express (with through coach for Penzance) near Aberdeen. 4-4-2 superheater locomotive No. 509, "Duke of Rothesay."

but on the 1·4 miles of easier subsequent grades, to the end of the 510, we attained 36½ m.p.h., further speeds up the bank being as follows:—

From Aberdeen.	m.p.h.
Up 1 in 96-271-344-510 accelerated to ..	36·3
,, 1 ,, 105-118 decelerated to	33·6
,, 1 ,, 154 maintained	33·6
,, 1 ,, 116 decelerated to	32·1
,, 1 ,, 102 ,, ...	28·3
Dn. 1 ,, 250 accelerated to	32·9
Up 1 ,, 164 maintained	32·9
,, 1 ,, 153 ,, ...	32·9

Moderate speeds were run on the easy subsequent grades to Stonehaven, not exceeding 62½ m.p.h., and the lowest rate on the short climb after Muchalls (1½ miles,

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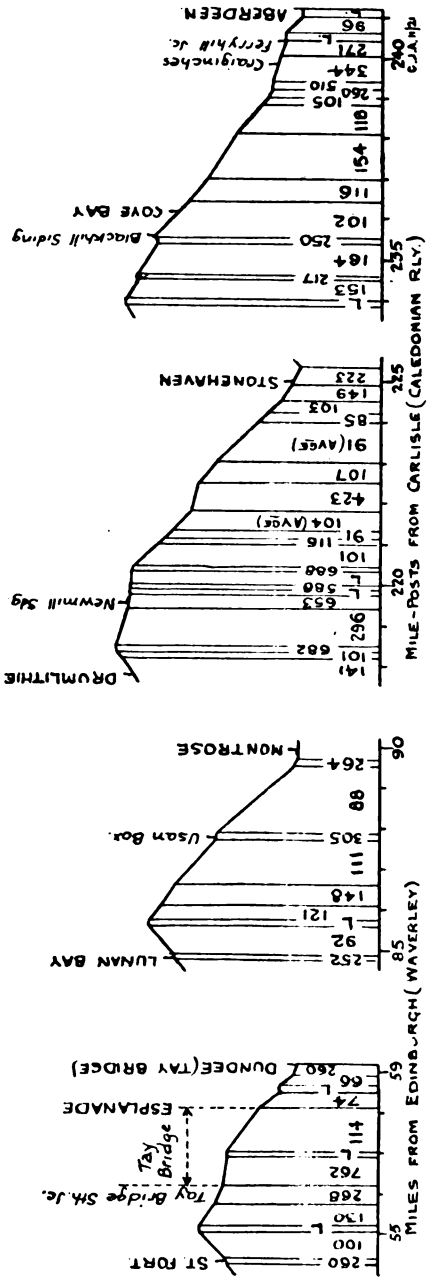
at 1 in 91–171) was 47½ m.p.h. A distant signal "on" as we approached Stonehaven indicated that the conditional stop was to be made, and it turned out that the



CALEDONIAN AND NORTH BRITISH RAILWAYS. ABERDEEN TO EDINBURGH (WAVERLEY).
PROFILES OF ASCENTS ON STARTING FROM ABERDEEN, STONEHAVEN, MONTROSE AND DUNDEE.

driver was to be compelled to stop this heavy train, and restart it on a worse grade than that just described, for the sake of *one* lady passenger! The unchivalrous thought that occurred to me was that it would have been cheaper in fuel, wear and tear and time to have compensated the lady for the extra trouble and sent her on by the train before.

There was some slight difficulty in getting a start on the 1 in 223, but the actual halt lasted only 70 sec., and Driver Kennedy once again displayed the same mastery over his engine as did the engine over the train. At the top of the 149—only 0·6-mile from the platform—we were doing 20·7 m.p.h. and then carried on in this remarkable fashion :—

From Stonehaven.	m.p.h.
Up 1 in 149 accelerated to	20·7
,, 1 ,, 103–85 ,, ...	22·3
,, 1 ,, 91 ,, ...	23·4
,, 1 ,, 107 ,, ...	26·2
,, 1 ,, 423 ,, ...	34·1
,, 1 ,, 104–91–116 decelerated to ..	33·6
,, 1 ,, 101 ,, ...	29·8
,, 1 ,, 296 accelerated to	41·7

The descent to Montrose was negotiated without excessive speed; we worked up gradually to 71½ m.p.h. at Fordoun, then fell to 53 on the 4 miles of slightly rising grades past Laurencekirk (which include 1½ at 1 in 285) before touching 70½ again at Marykirk. A length of 1½ miles up at 1 in 421 from Craigo had not succeeded in lowering our speed below 60 m.p.h. when we were dead slowed to take the tablet for the single line from Kinnaber Junction. The sharp descent between there and Montrose yielded a further momentary maximum of 56½ m.p.h.

Out of Montrose the climb is not so long, and the actual start is for a short distance level, but then follow nearly 1¾ miles continuously at 1 in 88. This we ascended steadily at 20·5 m.p.h. and the following subsequent speeds enabled us to negotiate the 4·1 miles from the start to the summit point in 10 min. 35 sec. :—

From Montrose.	m.p.h.
Up 1 in 88 accelerated to	20·5
,, 1 ,, 305 ,, ...	25·3
,, 1 ,, 111 ,, ...	27·8
,, 1 ,, 148–121 ,, ...	30·0

To my mind these were, in full consideration of load and gradients, three brilliant ascents. The remainder of the journey to Dundee was without particular note; on the sharp undulations between Lunan Bay and Arbroath we were not allowed to exceed 66 m.p.h., and the minimum of 47½ m.p.h. up a mile of 1 in 100 at Cauldcots was a good figure. Even the fine

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level stretch from Arbroath to Dundee is not without its hindrance, as the start from Arbroath is up 1 in 104–127 for 0·35 mile; after surmounting this, however, our average of 53 to a maximum of 58½ m.p.h. on the level was the least enterprising part of the journey. At Dundee *Aberdonian* came off, having dropped in actual running exactly 2 min., which is much more than accounted for by the slowing down for, and restarting from on the 1·7 miles at 1 in 103 up from St. Vigean's Junction was 27 m.p.h., and on the 2½ miles past Lunan Bay, averaging 1 in 96, 29 m.p.h.; there were the usual slacks for changing the tablet at Inverkeilor, Lunan Bay and Usan, and very restrained downhill running into Montrose, where 25 sec. more had been gained. The Montrose-Stonehaven times were without incident, minimum speed up 2 miles averaging 1 in 92 to Kinnaber being 30½

TABLE A.—NORTH BRITISH RAILWAY: DUNDEE-ABERDEEN.

Schedule.	868 4-4-2 53 330 350	Distance.	Engine No: Engine type: Load (axles): Load (tons tare): Load (tons full):	Distance.	868 4-4-2 38 272 285	Schedule.
Min.	Min. Sec.	Miles.		Miles.	Min. Sec.	Min.
0	0 00	0·0	ABERDEEN	16·2	23 05	24
2	2 40	0·6	Ferryhill Junction	15·6	21 40	21
—	9 45	4·8	Cove Bay	11·4	16 55	—
—	16 30	8·2	Portlethen	8·0	12 50	—
—	20 20	11·6	Muchalls	4·6	8 25	—
26	25 50	16·2	STONEHAVEN	24·5	36 15	36
—	13 15	5·4	Carmont	19·1	—	—
—	15 35	7·1	Drumlithie	17·4	26 55	—
—	19 25	11·1	Fordoun	13·4	21 40	—
—	22 40	14·4	Laurencekirk	10·1	17 55	16
—	26 10	17·6	Marykirk	6·9	12 30	—
54	30 15	21·8	Kinnaber Junction (SS.)	2·7	6 15	6
58	33 55	24·5	MONTROSE	13·6	21 35	22
—	6 40	2·1	Usan Box (SN)	11·5	18 40	—
—	12 05	4·8	Lunan Bay (S)	8·8	14 20	—
14	14 45	7·5	Inverkeilor (S)	6·1	11 05	9
—	18 20	10·7	Letham Grange	2·9	7 00	—
20	20 55	13·1	S. Vigean's Junction.	0·5	2 10	2
22	22 20	13·6	ARBROATH	17·0	22 00	24
—	3 40	1·8	Elliot Junction.	15·2	19 55	—
—	9 25	6·2	Carnoustie	10·8	15 00	16
15	16 55	13·1	Broughty Ferry	3·9	7 30	7
20	20 40	16·3	Camperdown Junction	0·7	2 30	3
23	22 55	17·0	DUNDEE	0·0	0 00	0

S: Single Line, slack for train staff. (S: South-bound, N: North-bound journeys only).
Thick horizontal line indicates booked stop.

Stonehaven; at least, one can hardly imagine that a stop at Stonehaven with a 350-ton train is contemplated in a 58-minute booking from Aberdeen to Montrose.

The same engine and driver, going north the same day from Dundee on the 2.20 p.m. from Edinburgh, had a lighter train of 285 tons, and gained time consistently. Two minutes were economised to Arbroath, with no higher speed on the level than 60 m.p.h., at Carnoustie. Sustained speed m.p.h.; up 3 miles past Marykirk averaging 1 in 111½, 31; and up 4½ miles from Fordoun to Drumlithie, averaging 1 in 170, 37½ m.p.h. This was considerably inferior in merit to the work on the return journey, but with no higher speed than 60 m.p.h. down to Stonehaven, and a general rate nearer 50 than 60, we were on time, save for a trifling loss of ¼-min. Up the two miles from Stonehaven averaging 1 in 107 sustained speed was 31 m.p.h., and the lowest subsequent speeds were 40 up the

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1 in 126 before Portlethen and 43 up the succeeding 1 in 116; downhill speeds were again restrained to a maximum of 62½ m.p.h., and a further minute was gained from Stonehaven to Aberdeen, leaving the engine a little over 3 min. to the good from Dundee.

Coming out from Edinburgh No. 875, *Midlothian*, did some excellent work on the 85-minute booking of the 2.20 p.m. express, gaining 2 min. on schedule with then followed the prolonged slowing right across the Forth Bridge (where, by the way, we encountered a perfect hurricane of wind, which was felt also in less intensity throughout the journey to Aberdeen), further complicated by a permanent-way caution, and, again, the severe slack through Inverkeithing North Junction, immediately speed had been recovered. From the latter junction is a 2¼-mile ascent, mainly at 1 in 94, to Dalgetty, on which

TABLE B.—NORTH BRITISH RAILWAY: EDINBURGH–DUNDEE.

Schedule.	875 34 250 260	Distance.	Engine 4-4-2 No: Load (axles): Load (tons tare): (Load (tons full):	Distance.	877 53 330 350	Schedule.
Min.	Min. Sec.	Miles.		Miles.	Min. Sec.	Min.
0	0 00	0·0	EDINBURGH (WAVERLEY)	59·2	85 20	83
—	7 00	3·5	Saughton	55·7	80 10	—
—	10 45	6·5	Turnhouse	52·7	76 50	—
14	14 50	9·5	*Dalmeny	49·7	73 05	69
	p.w.c.					
17	18 35	11·2	*Forth Bridge North Box	48·0	69 00	66
—	21 00	13·2	*Inverkeithing	46·0	64 55	62
—	26 20	16·0	Dalgetty Box (summit)	43·2	61 15	—
—	28 00	17·4	Aberdour	41·8	58 30	—
31	31 00	20·1	*Burntisland	39·1	54 05	52
—	34 55	22·7	Kinghorn	36·5	50 55	—
39	39 30	25·9	Kirkcaldy	33·3	47 50	—
—	42 30	28·0	Dysart (summit)	31·2	45 35	—
	p.w.c.				p.w.c.	
46	47 10	30·7	Thornton Junction	28·5	40 45	39
—	50 30	33·2	Markinch Junction	26·0	38 05	—
—	52 55	34·9	Lochmuir Box (summit)	24·3	36 00	—
58	57 10	39·1	Ladybank Junction	20·1	29 40	28
—	61 05	42·3	Springfield	16·9	25 45	—
—	63 25	44·6	Cupar	14·6	22 50	—
—	66 40	47·6	Dairsie	11·6	19 35	—
	p.w.c.					
72	70 30	50·9	Leuchars Junction	8·3	15 40	14
—	75 10	54·6	St. Fort	4·6	11 50	—
79	77 55	56·5	*Tay Bridge South Box	2·7	9 00	8
—	81 15	58·5	Esplanade	0·7	4 00	—
85	83 00	59·2	DUNDEE (TAY BRIDGE)	0·0	0 00	0

* Service slacks. p.w.c. Permanent Way Caution.

an eight-coach load weighing 250 tons empty and 260 tons with passengers. In point of difficulty, there is little or nothing to choose between the Edinburgh-Dundee and Dundee–Aberdeen sections; gradients are a little less lengthy on the former, but anything in the nature of high speed on favourable lengths is quite prohibitive, owing to the numerous enforced reductions of speed. The start was very leisurely, even the mile down at 1 in 110 past Turnhouse not getting us above 54 m.p.h.; we attained 32 m.p.h.; we were then slacked severely round curves at Aberdour, Newbiggin and Burntisland, touching 64½ m.p.h. between the two former. From Burntisland to Dysart is a continuous ascent, including a mile at 1 in 128 to 22 miles (Kinghorn), then easier grades to 25 miles (just before Kirkcaldy), where we were doing 47½ m.p.h. and finally steepening to two concluding miles at 1 in 100–114, on which we fell to 31½ m.p.h. Just beyond Dysart there was a severe p.w.

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caution, owing to a pitfall, and for the same reason we ran very cautiously down to Thornton Junction.

An exceedingly fine effort was made between Thornton and Ladybank Junctions, which resulted in the cutting of schedule time between these points from 12 to 10 min.; taking the first mile up at 1 in 129 at a minimum of 43 m.p.h., we accelerated to 48 on the ¾-mile level just before Markinch, and mounted 1¾ miles at 1 in 103 at a minimum rate of 39½ m.p.h., as a prelude to the attainment of 70½ m.p.h. on the subsequent descent. Brakes were applied at Kingskettle and a reduction to 40 m.p.h. followed at Ladybank. There are now no more difficulties in this direction of running; speed reached 65 m.p.h. before Cupar, where it was slightly reduced, and there was also a severe permanent-way caution on the falling gradient before Leuchars Junction; the usual slow running followed over the Tay Bridge and into Dundee. Net time from Edinburgh to Dundee would be about 79 min., or just under the recently accelerated schedule of this train, which is now 81 min. for this terribly hard stretch of line.

In the reverse direction No. 877, *Liddesdale*, had a tough task in continuing from Dundee with the 350-ton up night "Scotsman," on a booking of 83 min. to Edinburgh, though the time actually lost was only 2 min. 20 sec. From Dundee on to the Tay Bridge the very first mile includes rather over ½-mile at 1 in 66–74, to Esplanade station, and the next mile is at 1 in 114—perhaps the worst actual start of any from Aberdeen down to Edinburgh. Yet once again no assistance was given, and it was highly creditable to the driver that he succeeded in getting such a load across the Firth to Leuchars Junction with a loss of under 2 min. on schedule only. Leuchars was passed at 60 m.p.h., and the subsequent 1¾ miles up at 1 in 160 brought us down to exactly 45. Cupar was passed at 57½ m.p.h., after which 2 miles up at 1 in 243–161 (chiefly the latter) resulted in a minimum of 43½ m.p.h. Between each of these short ascents is a level "plateau"; on the third of these, to Ladybank Junction, we reached 56½ m.p.h. Falkland Road bank (3½ miles averaging 1 in 103), produced a minimum of exactly 30 m.p.h. at Lochmuir, and we were not allowed to exceed 64 on Markinch bank before slacking very severely for permanent-way

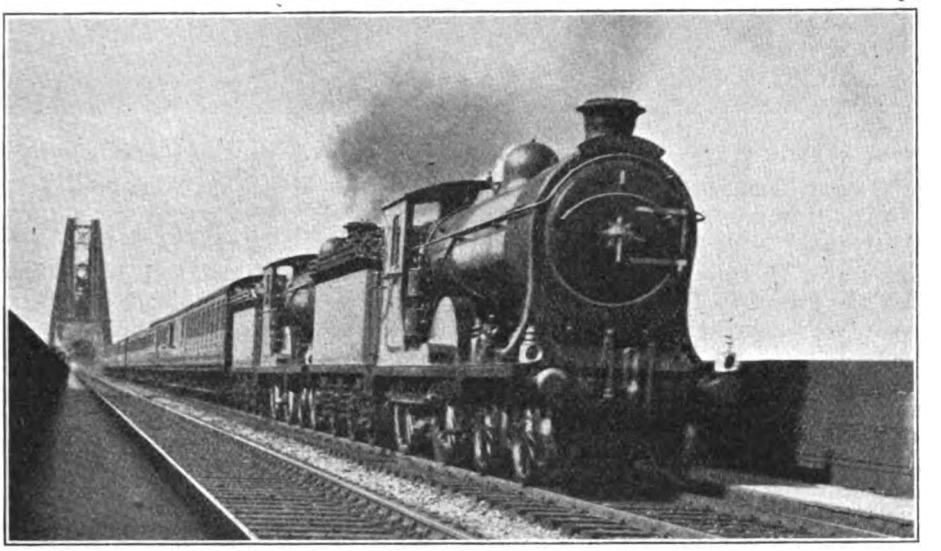

Photo.] NORTH BRITISH RAILWAY. [*Leslie J. Thompson.*

Aberdeen—Edinburgh Restaurant Car Express (with through coach from Elgin) leaving the Forth Bridge. 4-4-0 superheater locomotives Nos. 425, "Kettledrummle" and 422, "Kenilworth."

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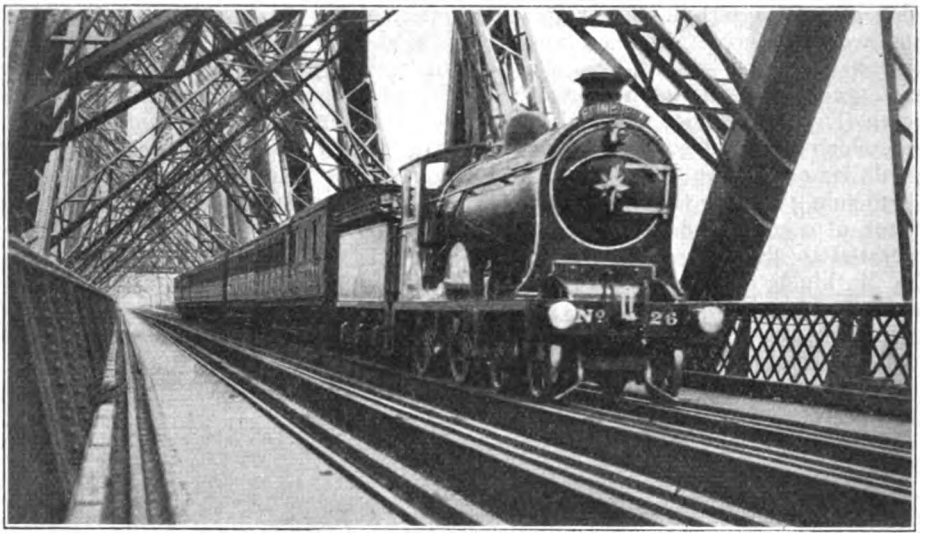

Photo.] NORTH BRITISH RAILWAY. [*Leslie J. Thompson.*

Dundee-Edinburgh "Fife Coast" Express via Crail crossing the Forth Bridge.
4-4-0 superheater engine No. 426, "Norna."

repairs at Thornton Junction. This spoiled the ascent to Dysart, after which we were yet again held strictly in leash down to Burntisland, with nothing more than 62½ m.p.h. and many slacks. A good ascent was made to Dalgetty (2 miles at 1 in 100), minimum speed 30 m.p.h., but after we had slacked over Inverkeithing Central Junction, the winding 2 miles at 1 in 70 up to the Forth Bridge brought us down to something like 20 m.p.h., so that 4 min. had now gone against the engine from Dundee. But by a smart finish into Edinburgh, with a top speed of 61 m.p.h. at Turnhouse, nearly two of these were won back. Net time from Dundee to Edinburgh was exactly the 83 min. allowed—a fine performance. It may be remarked that the maximum tare load allowed to an unassisted "Atlantic" from Aberdeen to Edinburgh is 340 tons, so that on this occasion we were practically up to maximum; in the north-bound direction the figure is 370 tons.

From Edinburgh we pass southward by the Waverley route to Carlisle, over positively terrific gradients, both longer and far more severe than those just dealt with. Here again I have prepared profiles of the chief climbs, and set out details of the work performed upon them by superheated "Atlantics." Going south No. 879, *Abbotsford*, worked by Driver T. Knowles, of Carlisle, had a substantial load of 285 tons out of Edinburgh, on the 9.45 a.m. express, but gained over ½-min. to Falahill Summit by the good and steady uphill work tabulated:—

From Edinburgh.	m.p.h
At Portobello	56·3
Up 1 in 80–100 decelerated to	38·1
On Level accelerated to	44·1
Up 1 in 175 decelerated to	43·7
,, 1 ,, 218–250–228 accelerated to ..	46·3
,, 1 ,, 70 decelerated to and maintained	27·8
,, 1 ,, 70 (last ½-mile) decelerated to ..	24·9
On Level (Gorebridge) accelerated to ..	29·6
Up 1 in 70 decelerated to	28·1
,, 1 ,, 111 accelerated to	30·4
,, 1 ,, 70 decelerated to	24·1
,, 1 ,, 70 recovered to	25·0
,, 1 ,, 100 decelerated to	22·9

The rapid fall on the final 1 in 100 was probably due to a premature notching up of the engine, as *Abbotsford* was blowing off when we passed Falahill Box. The latter is a point which should on no account be missed by timers; the box is on the up side. Hardengreen Junction (box on down side), which marks the beginning of the 1 in 70, and Niddrie South Junction, at the top of the 1 in 80–100 from Portobello, are also important timing points. From Falahill we strolled down to Galashiels at a speed never exceeding 64½, and varied by

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numerous slacks between that figure and 55 m.p.h., time being kept exactly.

The running from Galashiels to St. Boswell's was devoid of note, but from there we accelerated, with a reduced load of 220 tons, up 2½ miles, mostly at 1 in 245–120, to 44·1 m.p.h., increased this figure to 57 on a mile level and at 1 in 120 down, and fell again to 43 up 2¼ miles at 1 in 150 past Belses; down to Hawick speed was again restrained, with nothing in excess of 65 m.p.h. From Hawick up to Whitrope the climb starts right off the platform end with a mile at 1 in 74, but here again we experienced no difficulties, and by consistent climbing, hampered only by slipping in the summit tunnel, passed Whitrope Box (up side—another vital point to time) in 35 sec. less than the time allowed. The actual speeds on the ascent were as follows :—

From Hawick.	m.p.h.
Up 1 in 75–72–112 accelerated to ..	27·8
,, 1 ,, 123 ,, ...	31·5
,, 1 ,, 77–80 decelerated to	27·4
,, 1 ,, 117–121 accelerated to	34·6
,, 1 ,, 75 decelerated to	25·3
,, 1 ,, 96 accelerated to	26·2
(slipping in tunnel)	
,, 1 ,, 96 decelerated to	24·0

Nothing further of note occurred *en route*

Table C.—NORTH BRITISH RAILWAY: EDINBURGH–CARLISLE.

Schedule.	879 4-4-2S †43 †272 †285	Schedule.	895 &*898 4-4-0 N 31 187 196	Distance.	Engine No : Engine type : Load (axles) Load(tons tare) Load (tons full)	Distance.	Schedule.	880 4-4-2 S 29 183 195
Min.	Min. Sec.	Min.	Min. Sec.	Miles.		Miles.	Min.	Min. Sec.
0	0 00	0	0 00	0·0	Edinburgh	33·5	48	48 15
5	4 40	5	4 30	3·0	Portobello	30·5	43	43 20
7	6 40	7	6 28	4·3	Niddrie South Junction ..	29·2	41	41 20
—	8 50	—	8 12	6·2	Millerhill	27·3	—	39 45
12	11 45	12	10 54	8·3	Hardengreen Junction ..	25·2	37	37 10
—	13 50	—	12 39	9·7	Newtongrange	23·8	—	35 30
—	18 50	—	16 36	12·0	Gorebridge	21·5	—	32 50
—	27 45	—	24 03	16·0	Tynehead	17·5	—	27 25
33	32 25	33	27 39	18·0	Falahill Box (summit) ..	15·5	26	25 45
—	34 25	—	29 08	19·1	Heriot	14·4	—	23 35
—	38 00	—	32 30	22·6	Fountainhall	10·9	—	18 05
—	42 10	—	36 38	26·7	Stow	6·8	—	12 30
—	45 30	—	39 48	29·8	Bowland	3·7	—	8 05
—	48 30	—	43 00	32·5	Kilnknowe Junction ..	1·0	—	3 20
51	50 55	51	45 30	33·5	Galashiels	19·3	26	26 25
—	5 30	6	5 53	3·7	Melrose	15·6	—	21 35
10	9 45	—	5 15	7·0	St. Boswell's	12·3	17	17 30
—	7 20	—	10 01	4·6	Belses	7·7	—	12 45
—	11 25	—	14 32	8·0	Hassendean	4·3	—	8 30
17	16 40	22	18 02	12·3	Hawick	45·4	67	65 10
—	9 40	—	10 31	3·9	Stobs	41·5	—	59 35
—	15 40	—	16 40	7·0	Shankend	38·4	—	56 15
25	24 25	25	25 49	10·9	Whitrope Box (summit) ..	34·5	53	51 25
29	27 45	29	28 49	13·0	Riccarton Junction ..	32·4	48	46 45
—	32 20	—	32 53	16·6	Steele Road	28·8	—	39 50
38	37 00	38	37 15	21·1	Newcastleton	24·3	31	32 15
—	40 40	—	40 07	24·2	Kershopefoot	21·2	—	29 00
—	45 55	—	44 47	28·7	Penton	16·7	—	22 45
—	48 40	—	47 19	31·3	Riddings Junction ..	14·1	—	18 40
54	53 45	54	51 40 p.w.r.	35·8	Longtown Junction ..	9·6	14	13 40
—	59 40 sigs.	—	58 57 sigs.	41·0	Harker	4·4	—	8 10
67	69 55	67	68 35	45·4	Carlisle	0·0	0	0 00

Thick horizontal line indicates booked stop.

S : Superheater. N : Non-superheater. * Pilot to Hawick only.

† 41 axles (= 262/275 tons) from Galashiels ; 33 axles (= 207/220 tons) from St. Boswell's.

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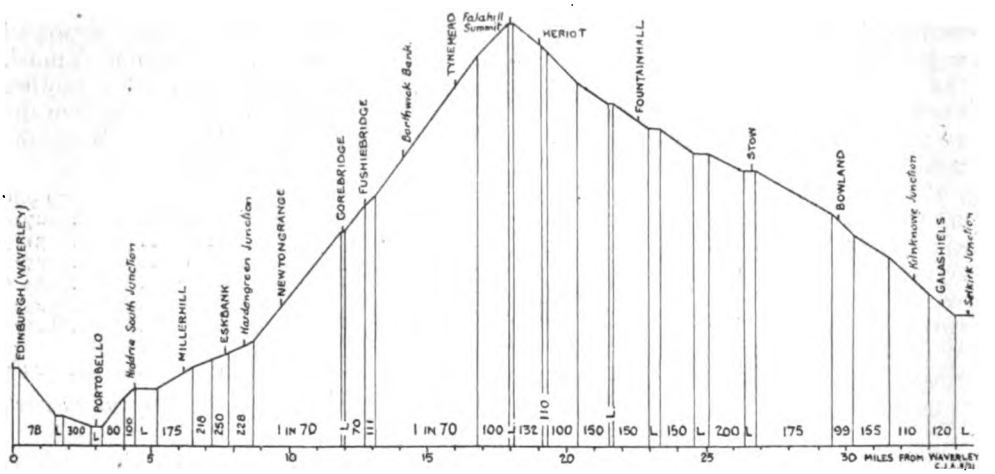

GRADIENT PROFILE, EDINBURGH TO GALASHIELS, NORTH BRITISH RAILWAY.

to Carlisle ; speed was reduced to 20 m.p.h. at Riccarton, and from there onwards was moderated almost excessively ; we should have kept time, however, but for the concluding signal delays.

In the opposite direction No. 880, *Tweeddale*, had a modest load, and took things easily on the fairly level stretch to Newcastleton, maintaining 60 an hour between Lyneside and Longtown, where we reduced to 50, falling from 56½ to 33½ m.p.h. up 3¾ miles at 1 in 100 past Riddings Junction to Penton, and keeping up from 53 to 58½ m.p.h. on the sharp undulations thence to the commencement of the climb proper. This was tackled in fine style, mile after mile of the continuous eight miles at 1 in 75 being run steadily at 32 m.p.h., in the neighbourhood of Steele Road, although the rate began to fall somewhat towards the upper part of the ascent, as shown herewith :—

FROM NEWCASTLETON.	m.p.h.
Up 1 in 380 maintained	53·0
,, 1 ,, 75 decelerated to	32·1
,, 1 ,, 75 maintained .. .. .. (past Steele Road)	32·1
,, 1 in 75 decelerated to .. .. (past Riccarton Junction)	30·0
,, 1 in 75 decelerated to	27·3
,, 1 ,, 80 decelerated to	26·2
,, 1 ,, 90 accelerated to	27·8

The engine thus gained as much as 2½ min. from Newcastleton to Whitrope, and with speeds kept down to 64–50 m.p.h. down to Hawick, and a very slow finish, we economised 1 min. 50 sec. from Carlisle. There is a six-mile rise out of Hawick, mostly at 1 in 150–200 ; in 1¾ miles at 1 in 150 from the actual start we got up to 31 m.p.h.—a smart feat. From Galashiels we were yet again inside the booked time allowance in climbing to Whitrope, after which a gentle descent to Portobello brought us into Edinburgh on time. Here are the details of the final climb :—

FROM GALASHIELS.	m.p.h.
Up 1 in 110 accelerated to	30·0
,, 1 ,, 155 ,, ...	38·5
,, 1 ,, 99 ,, ...	40·5
,, 1 ,, 175 ,, ...	42·5
,, 1 ,, 175 maintained	42·5
On Level (Stow) accelerated to	45·5
Up 1 in 200 decelerated to	42·9
On Level accelerated to	47·4
Up 1 in 150 decelerated to	42·9
On Level to Fountainhall accelerated to	45·5
Up 1 in 150 decelerated to	39·5
,, 1 ,, 100 ,, ...	31·7
,, 1 ,, 132 accelerated to	33·6
,, 1 ,, 132 decelerated to	32·6

A tare load of 290 tons is the maximum for unassisted " Atlantics " over this route, so that the journey in the opposite direction was made with practically the limit load as far as Galashiels.

The third journey shown in the Edinburgh–Carlisle table is one timed by a Peebles correspondent on the day of the post-war restoration of the 10.35 a.m. (now 10.40 a.m.) express from Edinburgh to St. Pancras, and is only included in view of the extraordinary times made by the two non-superheated " Scott " class 4-4-0 engines to Hawick, to which place the pilot was returning home. Both engines were, of course, very lightly loaded, with a little under 100 tons apiece, but even so a gain of nearly 5½ min. from

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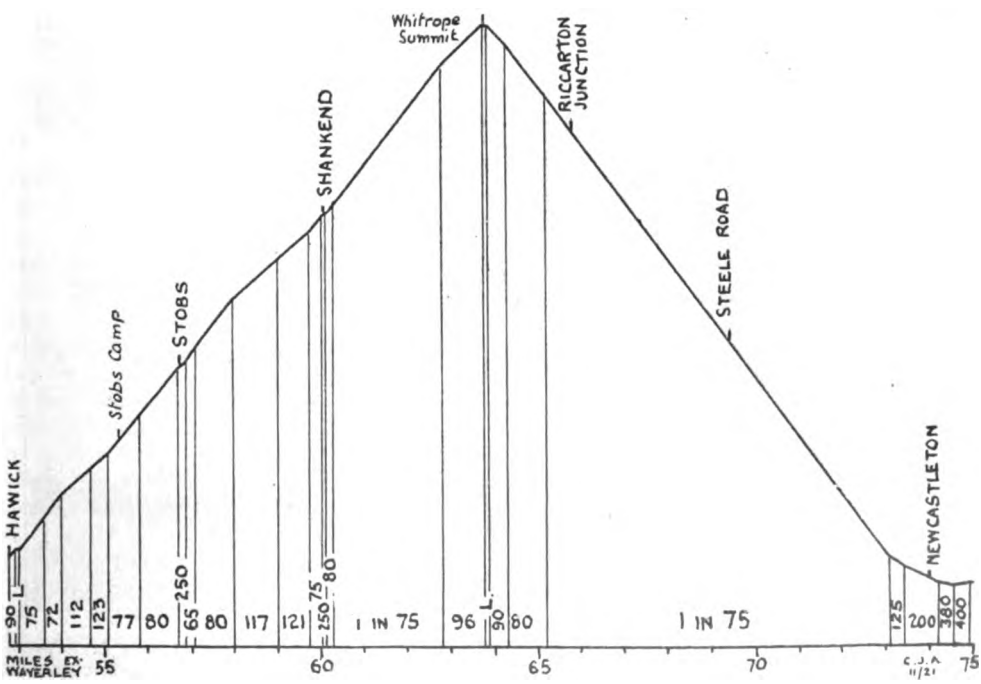
Edinburgh to Whitrope, and another of 4 min. from Melrose to Hawick (whereby the latter run was made at an average speed of 51·1 m.p.h. start-to-stop) is sufficiently startling to warrant some comment. Speed averaged 50 m.p.h. from Millerhill to Eskbank, and up the long 1 in 70 stretches fell fairly rapidly to a little under 35 m.p.h. at Gorebridge, whence the fall was more gradual to a minimum of 29·8 m.p.h. at Tynehead. From the latter station there was a recovery up the final 1 in 100 to 34·6 m.p.h. at Falahill. After Hawick No. 895 alone did not quite succeed in keeping time to Whitrope, but the loss was less than a minute, and this was partly accounted for by a slight p.w.r check in the neighbourhood of Stobs. Much higher speeds were run by the 4-4-0 than by the "Atlantic" from Whitrope to Carlisle, the 19·2 miles from Steele Road to Longtown, in particular, being covered in 18 min. 47 sec.; but even this speed, of course, does not represent the possibilities over these favourable grades, were not the line so infested with curves. Permanent-way and signal checks prevented the early arrival at Carlisle which would certainly have been effected otherwise.

It needs abnormal loads or recovery from delays to infuse interest into the running between Edinburgh and Glasgow by the North British route, as the timings over the remarkably flat course between Cowlairs and Haymarket or Waverley are too easy, in normal circumstances, to elicit any effort worth description from the efficient superheated 4-4-0 engines engaged on this service. One of the newest of the type—No. 500, *Black Duncan*—made some good running the other morning, however, when the conditional stop at Lenzie on the 8.40 a.m. from Glasgow had been called. The load was of an extraordinarily mixed character—4 North British Railway non-corridors for Edinburgh, 2 North British Railway corridors for York, 1 North British Railway and 1 Great Western Railway corridors for Southampton, a Great Eastern Railway composite corridor for Harwich, and two E.C.J.S. corridor coaches for London, all bogie stock and weighing 325 tons empty and 340 tons full. Scrupulous care was taken at Glasgow to keep "local" passengers out of the seven through vehicles, with the result that these were nearly empty and the four leading coaches, which ould more than easily have



GRADIENT PROFILE, HAWICK TO NEWCASTLETON, NORTH BRITISH RAILWAY.

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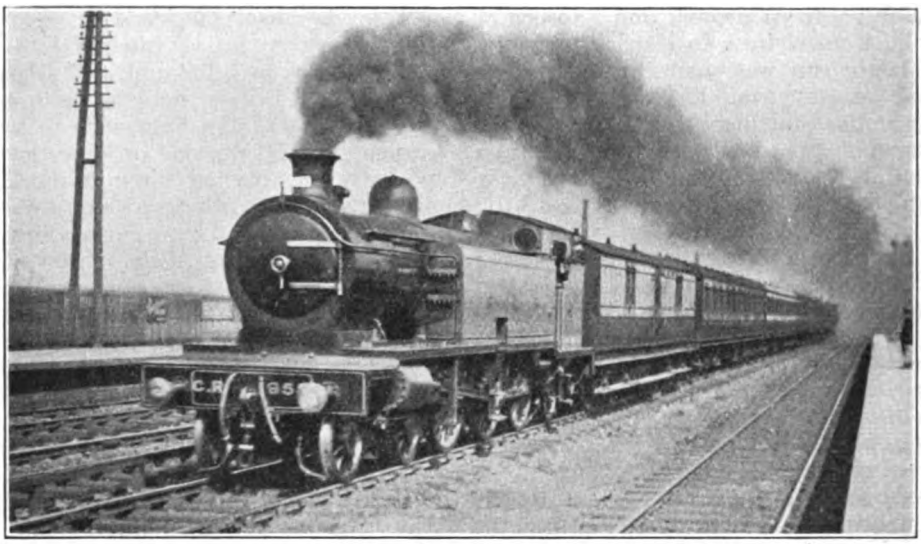

Photo.] CALEDONIAN RAILWAY. [*Henry L. Salmon.*

Down Wemyss Bay Express passing Cardonald. 4–6–2 superheater tank engine No. 955.

been dispensed with, were packed. Up the 1 in 40 to Cowlairs (1·5 miles), passed in 5 min. 55 sec., we were banked in rear, as usual, by a 0-6-2 tank; thence we ran the 4·8 miles to Lenzie stop in 7¾ min. The duration of this halt—10 sec.—would have satisfied the most exacting "Underground" official; from Lenzie we passed Croy, 5·2 miles, in 8 min. 20 sec., Greenhill Upper Junction, 11 miles, in 14 min. 25 sec. (3¼ min. late here), and Falkirk, 15·5 miles, in 19¼ min., reaching Polmont, 18·7 miles, in 23 min. 35 sec. Acceleration from Lenzie was slow, but from Castlecary to

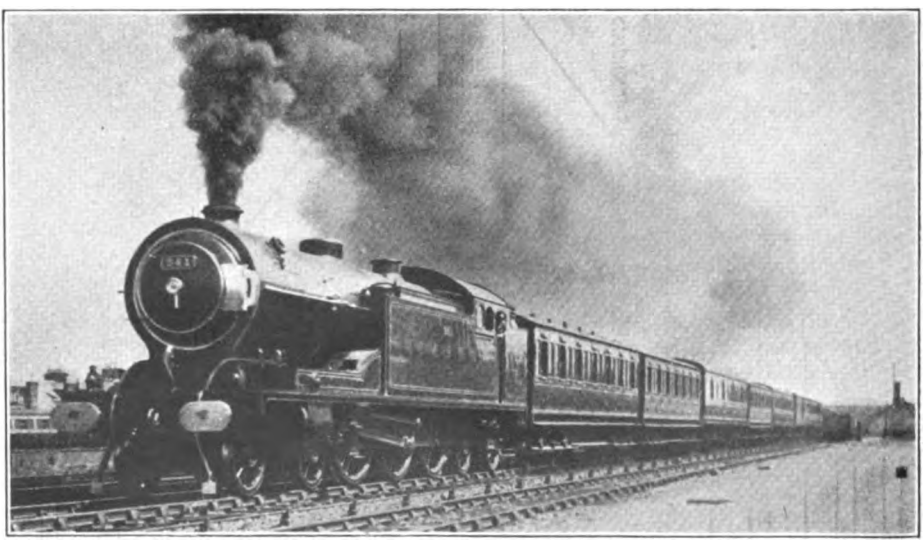

Photo.] GLASGOW & SOUTH WESTERN RAILWAY. [*Henry L. Salmon.*

12.30 p.m. Glasgow-Stranraer Express leaving Paisley (Gilmour Street).
4–6–4 superheater tank engine No. 541.

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Bonnybridge we maintained a little over 61 m.p.h., after which came two slight p.w.r. checks.

Arriving at Polmont 2¾ min. late, the booked stop was cut by a minute, and we then made a very smart run to Haymarket, 21·2 miles, in 23 min. 35 sec.—nearly 3½ min. less than schedule—having made the full journey from Glasgow in 2 min. less than booked time, despite the extra stop and the two slacks. We passed Linlithgow, 4·7 miles, in 7 min., Winchburgh Junction, 9·7 miles, in 12 min. 10 sec., Ratho, 14·1 miles, in 16 min. 20 sec., and Saughton, 18·8 miles, in 20 min. 50 sec. from Polmont, tons, *Lady Rowena* then passed Linlithgow in 7 min. (at reduced speed owing to a p.w.r. caution), Winchburgh Junction in 12¾ min., Ratho in 16 min. 50 sec., and Saughton in 21 min. 5 sec., reaching Haymarket in 23 min. 50 sec., or 23 min. net—a gain of no less than 4 min. in this short 21·2 miles' distance, and a really fine piece of 4-4-0 locomotive work. Speeds rose to 65 m.p.h. at Winchburgh, 66 at Ratho, 67 at Gogar and 68 at Saughton.

In the opposite direction the best out of a number of time-keeping journeys was one on the 6.45 p.m. dining car express out of Waverley—a 60-min. non-stop train—

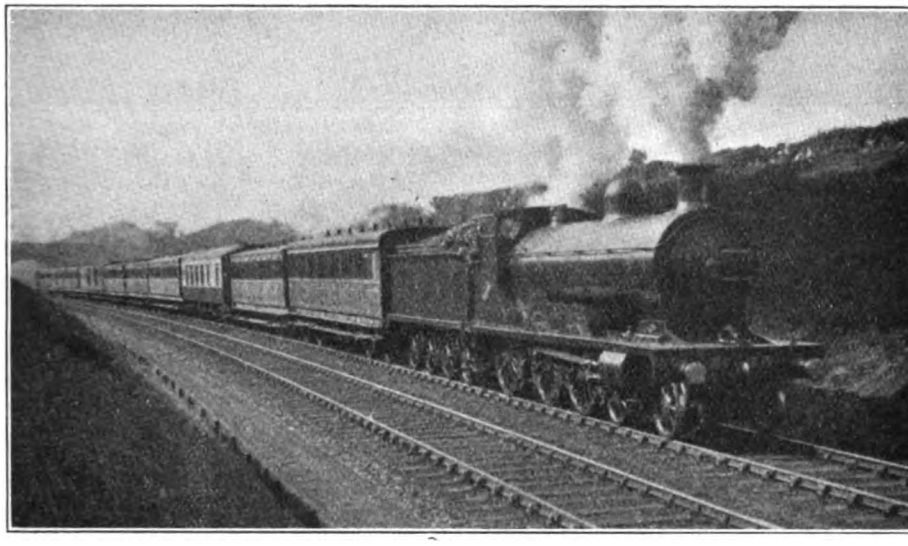

Photo.] HIGHLAND RAILWAY. [*Henry L. Salmon.*

Down Pullman Car Express near Stanley Junction. 4–6–0 locomotive No. 35, "Urquhart Castle."

speed ranging from 64 to 65 m.p.h. between Winchburgh and Saughton. Excluding Lenzie stop, for which no additional time is allowed in the schedule, net time from Glasgow to Polmont was 33 min., or 2 min. less than booked, so that the driver had 5¼ min. to his credit. On another occasion No. 424, *Lady Rowena*, had a ten-coach load of 310 tons on the same train, passed Cowlairs in 5¾ min., Lenzie in 12 min. 50 sec., Greenhill Junction in 25 min. 5 sec., Falkirk in 30 min., and reached Polmont in 34 min., without speed exceeding 57½ m.p.h.; then at Polmont a defect developed in a coach, which caused some delay and necessitated its removal from the formation; with load lightened to 280 heavily loaded with 8 corridor 8-wheelers and two 12-wheeled steel "diners" to a total of 333 tons empty and 350 tons full No. 499, *Wandering Willie*, was the engine, and the wanderings of *Willie* on this occasion were distinctly creditable. We passed Saughton, 3·5 miles, in 6 min. 40 sec.; Ratho, 8·2 miles, in 12¾ min.; Winchburgh Junction (box on north side), 12·6 miles, in 17¾ min.; Linlithgow, 17·6 miles, in 23 min. 5 sec.; Polmont, 22·3 miles, in 27 min. 50 sec.; Falkirk, 25·5 miles, in 31¼ min.; Greenhill Upper Junction (box on south side), 30 miles, in 35 min. 55 sec.; Croy, 35·8 miles, in 42 min. 5 sec.; and Lenzie, 41 miles, in 47 min. 25 sec. The engine was now eased, but

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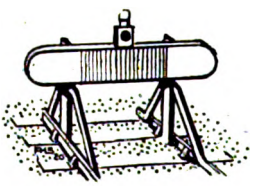
Photo.] CALEDONIAN RAILWAY. [*Henry L. Salmon.*

West Coast Express Goods train. 4-6-0 locomotive No. 938.

the passing time to Cowlairs, 45·8 miles, was 54 min., prior to the usual crawl down Cowlairs bank into Glasgow, where we stopped in Queen Street station, 47·3 miles, in 59 min. 5 sec. from Edinburgh. After the initial slight rise from Edinburgh to Philpstoun, speed ranged between 56½ and 64½ m.p.h. all the way thence to Lenzie—a very fair exhibition with this load.

I have ready tabulated a number of journeys over the rival Caledonian route, but exigencies of space demand that these shall be held over until the March issue. Caledonian main line working between Carlisle and Glasgow was dealt with as recently as August last, and also the running of the new 4-6-4 tank engines on the Glasgow and South Western Railway in the same issue; but with the Edinburgh–Glasgow runs referred to I shall hope to include a Glasgow–Carlisle series on the line last-mentioned, as well as one or two experiences on the Caledonian Northern main line. Meanwhile, in February, in response to many requests, it is my intention to detail my first journeys behind those latest and finest developments of British locomotive engineering—the Gresley "Pacifics" on the Great Northern Railway—compared with the work of the standard "Atlantics" of that line on the same trains. In conclusion, may I take this opportunity of thanking the numerous correspondents who have favoured me with full and explicit details of the loading of the chief 60-minute expresses between Victoria and Brighton? I shall hope to refer to their letters in an early article.



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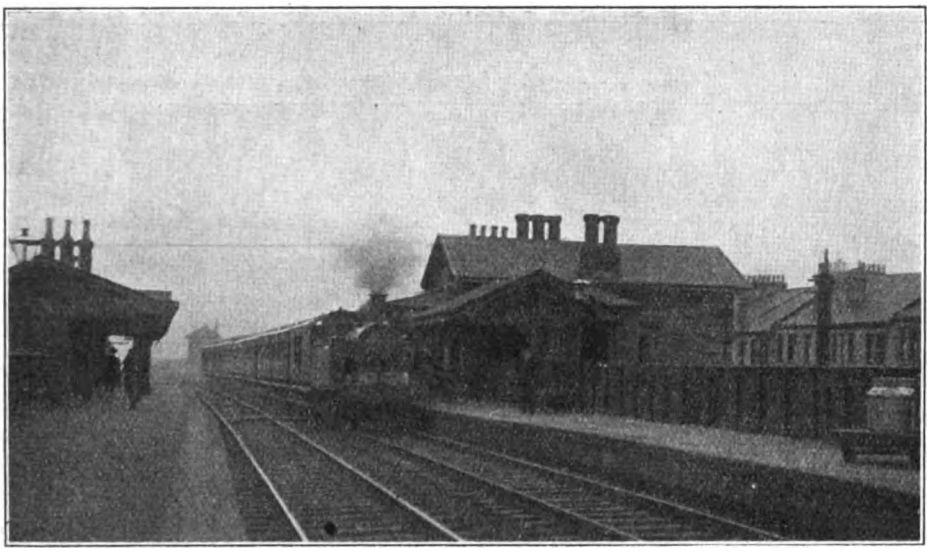

GLASGOW-BEITH TRAIN AT BARRHEAD (JOINT) STATION.
Glasgow & South Western Railway rolling-stock and 0-4-4 tank engine.

The Glasgow, Barrhead & Kilmarnock Joint Railway.

By J. FRANCIS.

(Photographs of Stations by the Author.)

THIS railway, for many years regarded as an essential part of the Glasgow-Carlisle main line of the Glasgow & South Western Railway, will attain its jubilee on June 26, 1923, the section from Stewarton to Kilmarnock and the Beith branch having been opened on June 26, 1873. Previously, the Glasgow & South Western Company operated its traffic from Glasgow, via Paisley, Dalry and thence to Kilmarnock. The Kilmarnock Direct Railway had, however, been projected, but in view of the fact that the Caledonian Company was also associated with schemes for the Glasgow, Barrhead & Neilston Direct and Glasgow Southern Terminal Railways, and that the Crofthead and Kilmarnock Extension had been proposed, the Kilmarnock Direct Railway was abandoned in favour of a joint scheme for a line from Glasgow to Kilmarnock via Crofthead, authorised by Act of July 12, 1869, in which the two companies were jointly interested, each appointing four directors. The Caledonian Company had already constructed a line from Glasgow to Neilston. The extension to Stewarton was opened on February 15, 1871, and to Kilmarnock, with the Beith branch, as already mentioned, on June 26, 1873.

As first constructed, the Glasgow terminus was in what is now the South Side goods station, a short distance south of Gorbals station. This remained in use for some time afterwards, but when St. Enoch station was completed in 1877, the South Side station was given over entirely to goods traffic. Some of the original premises can still be identified, while the courtyard of the station is now a small recreation ground for children. The Joint Line, therefore, commences really at Gorbals Junction, platforms being, in fact, provided only on the Joint Line, the four tracks of the Eglinton Street and Paisley routes curving away directly alongside the station, but having no platforms. Just north of Strathbungo station connection is made with the

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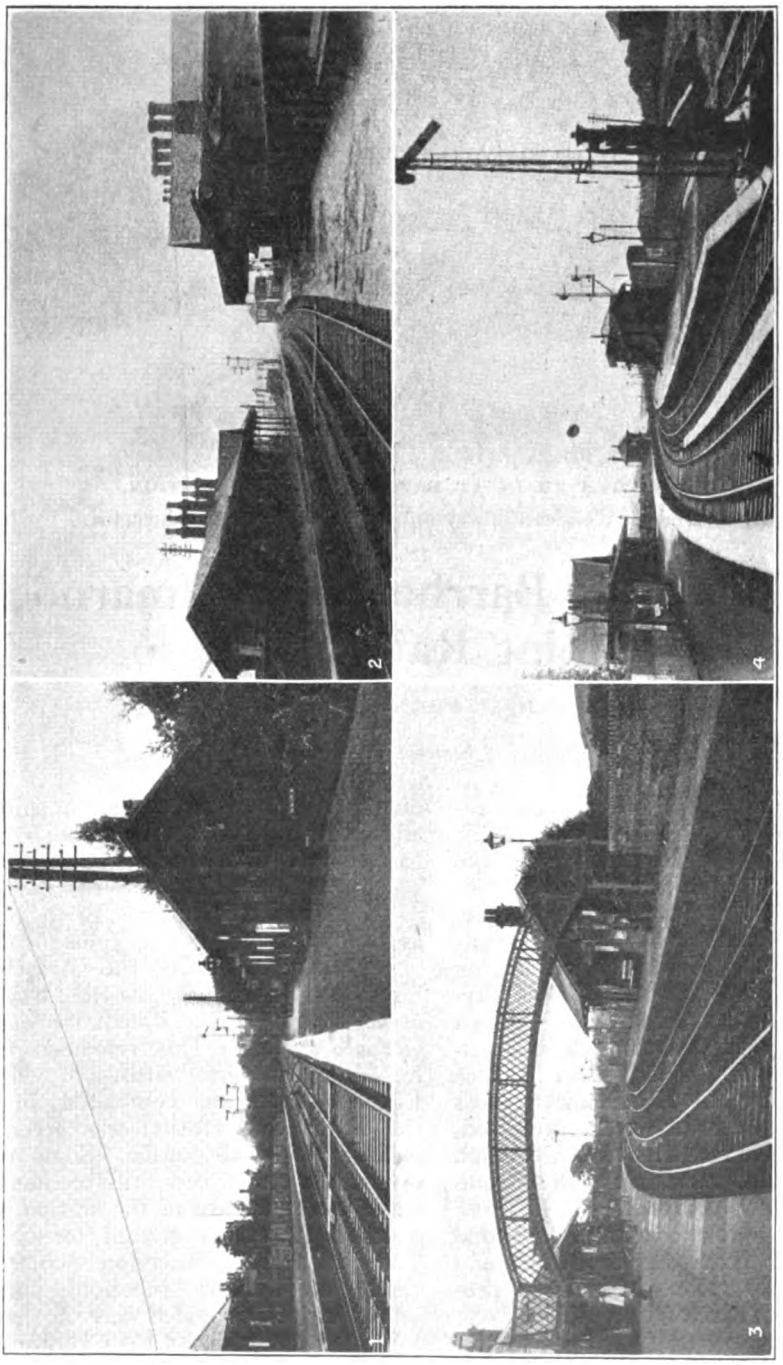

STATIONS ON THE GLASGOW, BARRHEAD AND KILMARNOCK JOINT RAILWAY.

1. Pollokshaws.
2. Barrhead (Joint).
3. Lugton.
4. Stewarton.

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Caledonian Railway, this being the route for passenger trains from Glasgow (Central) station. There is, however, an intermediate connection for traffic from the Motherwell direction at Langside Junction, between Gorbals and Strathbungo. At Busby Junction, 37 chains beyond Pollokshaws passenger station, Caledonian trains for Busby and East Kilbride leave the joint line. At present the section from Strathbungo to Busby Junction is the only part of the Joint Railway over which the Caledonian runs regular passenger trains, though, in the past, that company made greater use of the Joint Line, and is entitled to do so still. For goods traffic the Caledonian Company makes use of the whole length of the Joint Line, though as it constitutes, in effect, the main line to England of the Glasgow & South Western Company, their traffic, both passenger and goods, naturally predominates.

Between Glasgow and Pollokshaws the stations are fairly close together, and were it not for the fact that the district is so well served by electric tramways, and both the Caledonian and Glasgow & South Western Companies have for many years adopted the policy of cultivating outer suburban traffic rather than of attempting to meet the short-distance requirements of so congested a district, these would all be busy inner suburban stations. As it is, sufficient trains are provided to meet the passenger traffic requirements of these stations at busy periods and to enable Glasgow business people to take their mid-day meals at home. Kennishead and Nitshill serve rather attractive residential districts, the crowded environs of Glasgow having by this time been left behind. At Kennishead a goods branch to Spiersbridge diverges, this serving several industrial establishments, while at Nitshill there is a colliery branch.

Barrhead (Joint), the next station, serves the busy industrial town of Barrhead. At one time the traffic of the town was thought to justify more extensive railway facilities, and, in addition to the Joint station, the Glasgow & South Western Company constructed a branch to a more central station, operating trains thereto; also from Paisley via Potterhill. The latter service was, however, discontinued after September, 1907, and during the war (in January, 1917) Barrhead (Central) was closed and all traffic diverted to the Joint Line station, where it still continues to be dealt with. The Caledonian trains from Glasgow (Central) to Kilmarnock via the Joint Line were also withdrawn in January, 1917, by mutual arrangement between the companies. The Central station at Barrhead, notwithstanding that it has one fine double-sided terminal platform, well sheltered from end to end, and with modern station buildings, is meantime closed, the extra expense involved in staffing it under the present conditions of high costs and reduced traffics outweighing any benefit likely to be derived from its re-opening, at least until the prevailing depression in trade has passed and traffic has improved. Furthermore, alongside it, separated only by a public road, is Barrhead (New) station, on a branch of the Caledonian Railway, which was never even opened for traffic, so that (as one of the photographs reproduced shows) it is possible to include in one view parts of two railway stations, neither of which is now in use, and one of which was never opened for traffic, and, as regards the station buildings, is partially derelict. Associated with the Joint Line there is a goods and mineral depôt, and considerable sidings are in evidence, indicating that, although all traffic is now concentrated at the Joint station, Barrhead is well supplied with railway facilities and that this busy town is responsible for traffic to an important degree. Although the Joint Line has fewer trains than in pre-war days between Glasgow and Barrhead, there are reasonably frequent stopping trains throughout the day, including some which terminate at Barrhead (Joint), and at busy hours the facilities are quite sufficient to meet the needs of residential traffic.

Two miles beyond Barrhead is Neilston station, also in considerable favour for residential purposes. At this point the Caledonian route from Glasgow to Ardrossan, via Muirend and Patterton, comes within a short distance of the Joint Line, though, owing to high land intervening, not much of it can be seen from the latter. Near Caldwell, however, the Caledonian line comes into view, the station thereon, known as Uplawmoor, utilising, in fact, the correct name of the district, Caldwell

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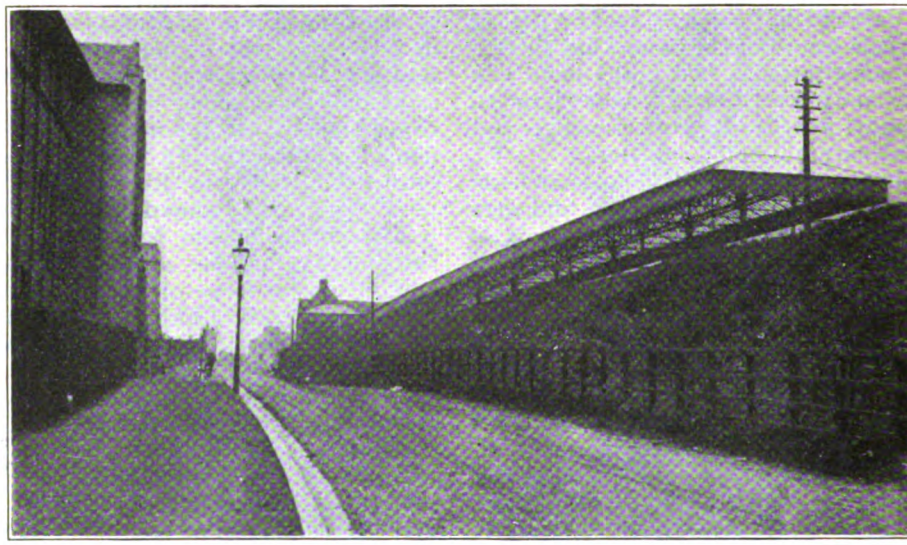
station obtaining its name from the Caldwell estate. The two lines continue parallel until beyond Lugton station. A connecting line is provided between them north of the respective stations, which are almost alongside one another, and interchange sidings are provided adjacent to the Joint Line station. The latter is a junction, the branch to Beith diverging to the west also serving several industrial establishments. The main route towards Kilmarnock continues southward, and passes under a girder bridge carrying the Caledonian branch to Ardrosssan, which approximately parallels the Beith branch a considerable manufacturing town. Kilmaurs, the last station on the Joint line, may be regarded almost as a suburb of Kilmarnock. At the latter place the Glasgow, Barrhead & Kilmarnock Joint Railway exercises running powers into the Glasgow & South Western station, though it has its own goods depôt.

Although the Glasgow, Barrhead & Kilmarnock Joint Railway is utilised by the Glasgow & South Western Company as its main route to the south, it is by no means an easy one. In fact, it is characterised by very steep gradients, including 1 in 100 to reach Barrhead from the



BARRHEAD (NEW), AND BARRHEAD (CENTRAL) STATIONS.

The former, to the left, was never opened, and the latter, closed during the war, has not yet been brought again into use.

as far as Barrmill, where, in fact, a connection is provided, though it is not at present in use. From Barrmill the Beith branch continues as a single line to its terminus. The station has a single platform, with goods yard adjoining, and deals with a considerable goods traffic. It is, however, about a mile distant from the Glasgow & South Western Beith station on the Glasgow-Ayr main line.

South of Lugton the Joint Line traverses country which virtually all the way to Kilmarnock has no other railway facilities within several miles. Dunlop serves a somewhat interesting residential district, while Stewarton deals with the traffic of North, 1 in 67, 78 and 69 thence to Neilston, and 1 in 70 for 1½ miles to the summit between Neilston and Caldwell. North-going trains have to face adverse grades at 1 in 180, 87, 152 and 75 to the summit near Dunlop, and there are shorter lengths at steep grades for trains in both directions. Once clear of the Glasgow district, however, the country traversed is, on the whole, somewhat picturesque. At Crossmyloof, though within the Glasgow area, the train passes between extensive allotment gardens, with numerous glasshouses, the combination providing, in fact, a distinctly interesting view from the train. Pollokshaws

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station is also rather prettily situated, with platform gardens. At Kennishead the station is situated somewhat picturesquely on an embankment. At Nitshill a memorial stone is erected on the down platform—

"IN
MEMORY OF
SERGT. JOHN MEIKLE, V.C., M.M.
LATE CLERK AT NITSHILL STATION,
WHO ENLISTED IN H.M. FORCES
(SEAFORTH HIGHLANDERS),
8TH FEBRUARY, 1915, DURING THE
GREAT WAR, AND WAS KILLED IN
ACTION ON 20TH JULY, 1918.
ERECTED BY HIS RAILWAY COMRADES."

Between Barrhead and Neilston interesting views are had over the surrounding country, and for some distance a rushing stream immediately parallels the line, being carried, in fact, between retaining walls alongside the track. On the Beith branch a good view is obtained of a viaduct carrying the Caledonian Company's Ardrossan line across the valley. The branch is double track from Lugton to Barrmill Junction, but the station has only a single platform on the up side. This constitutes the checking station for trains in both directions, Beith tickets being collected on the outward journey and examined when returning from Beith.

As already indicated, all passenger trains on the Joint Line are now provided by the Glasgow & South Western Company, including locals between Glasgow and Barrhead and one or two which terminate at Neilston, except for Caledonian trains between Strathbungo and Pollokshaws (as previously referred to) and in regard to the Beith branch from Lugton.

Local services between Lugton and Beith are worked in connection with trains between Glasgow and Kilmarnock. For ordinary passenger trains the Joint line owns two six-wheeled vehicles. One is a first and third composite and the other a first, third and brake composite. They are painted in the old Caledonian livery, as still used for Cathcart Circle trains in Glasgow, but are lettered "G.B. & K." and numbered 1 and 2. Certain of the branch trains are mixed, and in that case a Caledonian four-wheeled vehicle is sometimes used in place of the Joint Line coaches, the guard travelling in a goods brake van. The locomotive used at the time of the writer's visit was a Caledonian Railway 4–4–0 tank engine, No. 11, of the black-painted condensing class.

There are, however, two through trains each way between Glasgow and Beith, leaving St. Enoch at 6.25 a.m. daily, 1.8 p.m. on Saturdays, and on other days at 5.5 p.m., in each case calling first at

BEITH STATION.

Showing branch train, with G.B. & K.J.R. vehicles and C.R. 4-4-0 tank engine.

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Photo.] [*Whyte & Sons.*

MR. J. KERR,

Secretary and General Manager, Glasgow, Barrhead & Kilmarnock Joint and Glasgow & Paisley Joint Railways.

Barrhead (Joint), the corresponding down trains leaving Beith at 7.53 a.m., on Saturdays at 2.25 p.m., and on other days at 6.10 p.m. These trains are worked by a Glasgow & South Western 0–4–4 tank engine and that company's rolling-stock. Traffic arrangements on the Joint Line as a whole give good facilities to suit residential traffic. Thus the 7.52 a.m. from Kilmarnock runs non-stop from Dunlop to Gorbals, while the 8.50 calls only at Barrhead (Joint) in addition. The 7.53 from Beith is fast from Barrhead (Joint) to Gorbals, and all stations obtain at least one, if not two, trains to Glasgow due in St. Enoch between 8.30 and 9 a.m. In the opposite direction the 5 p.m. Kilmarnock train calls only at Barrhead (Joint) to pick up before reaching Lugton, while the 5.5 p.m. Beith train serves stations between Barrhead and Lugton. The 5.35 p.m. provides a non-stop train for Kilmarnock, and the 6 p.m. serves all stations from Barrhead onwards. Stopping trains for stations to Barrhead are provided at 5.10, 5.40 and 6.10, the last-mentioned being continued to Neilston. On Saturday afternoons there are corresponding fast trains at 1.3 p.m. (first stop Dunlop), 1.8 p.m. (first stop Barrhead), and 1.35 p.m. (first stop Lugton), with through expresses to Kilmarnock at 12.10 and 2 p.m., and stopping trains to Barrhead or through to Kilmarnock at 12.20, 12.45, 1.12 and 2.2 p.m. As usual in Glasgow, trains are provided to enable season-ticket holders to travel homeward for the mid-day meal, the trains in principal favour being the 12.32 and 12.55 p.m. from St. Enoch, and trains due back at 1.45 and 2 p.m.

Caledonian trains on the Glasgow–East Kilbride route which serve Strathbungo, Crossmyloof and Pollokshaws stations on the Joint Line are fairly numerous. The 7.50 a.m. from East Kilbride calls only at Pollokshaws on the Joint Line; the 8.10 and 8.50 a.m. are fast from Busby, and therefore pass all Joint Line stations; the 8.26 from Busby calls only at Strathbungo; and the 8.45 a.m. from Busby omits all Joint Line stations. Including stopping trains there are six trains on this route due in Glasgow (Central) between 8.27 and 9.38 a.m. For the evening traffic, trains leave Glasgow (Central) for East Kilbride or Busby at 5.9, 5.35, 6.6 and 6.23 p.m., and on Saturday afternoons at 12.54, 1.6, 1.30 and 2.35 p.m., several being fast, and in some instances passing some or all of the Joint Line stations. On this route, also, there are midday trains outwards from Glasgow (Central) at 1.6 p.m. (fast) and 1.8 p.m., with return trains due at 2.13 and 2.38 p.m. In this case there is no great need for facilities in regard to inner suburban stations, in that Strathbungo, Crossmyloof and Pollokshaws are served by trains from and to St. Enoch, besides being within easy distance of stations on the Cathcart Circle line.

No mention has been made of the through Glasgow–Carlisle expresses which also traverse the Joint Line, in that passengers are not as a rule allowed to travel by these between Glasgow and Kilmarnock. The non-stop facilities between these two places are usually given by main line trains serving principal or all stations south of Kilmarnock. There are, however, sufficient fast trains to meet the requirements of the important business travel between Glasgow and Kilmarnock, the restriction upon passengers using the through Anglo-Scottish trains being mainly

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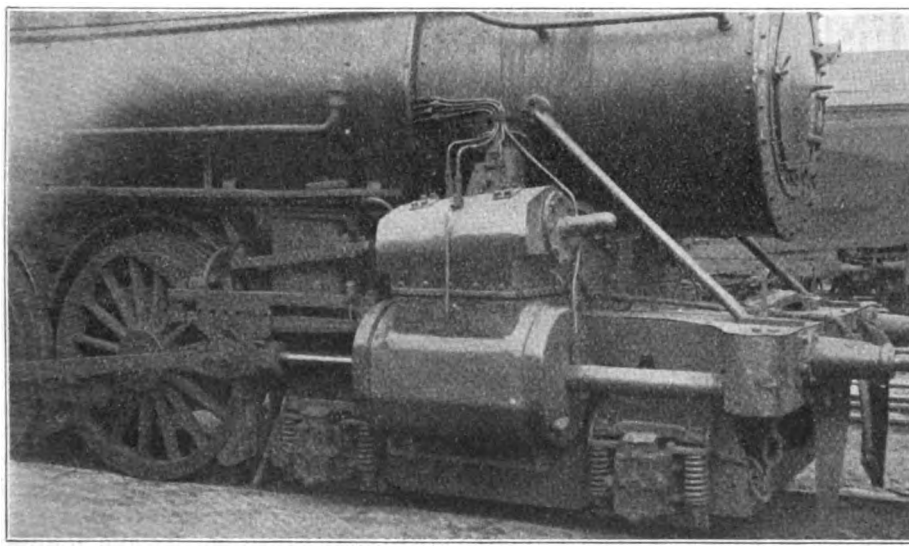
due to the fact that they have sufficient traffic on their own account.

Goods traffic on the Joint Line is chiefly dealt with by the Glasgow and South Western Company, in that it is so largely associated with its through traffic. The Caledonian Company, however, comes upon the Joint Line at several places, and in the aggregate takes a good share in the goods and mineral traffic.

The Glasgow, Barrhead and Kilmarnock Joint Railway is maintained by the railways concerned. It has its own operating and traffic staff under the direction of Mr. J. Kerr, who has for the past 23 years held the position of Secretary and Manager. Mr. Kerr entered Joint Line service in 1874, previous to which he was for eight years with the Caledonian company.

Until 1915 the Glasgow, Barrhead & Kilmarnock Joint Line had its own engineer, but since that date the Chief Engineer of the Glasgow and South Western Railway has been responsible. We are indebted to Mr. Kerr, also to Mr. Cooper, General Manager and Mr. Armstrong, Superintendent of the Line, Glasgow and South Western Railway, and their assistants, for material utilised in the compilation of this article.

IMPROVING OLD LOCOMOTIVES ON THE NEW SOUTH WALES GOVERNMENT RAILWAYS.



MR. A. A. BOWLES, of Sydney, sends particulars of the rebuilding of a class of 4–6–0 locomotives, originally constructed in 1891 by the Baldwin Locomotive Works of Philadelphia, United States of America, with superheaters, piston valves in place of slide valves, and new bogies. Four of these have been thus rebuilt. The cylinders of engine No. 455 were in good condition, so instead of removing them, the old steam chest covers were replaced by a special piston valve casting fitted as shown in the photograph reproduced, thus saving the cost of new cylinders. In this class of locomotive the cylinder castings form a saddle for the boiler; therefore, in addition to the saving of new cylinders, a considerable sum of money was saved through not having to rebuild the front end of the engine. One of these engines rebuilt, but having new cylinders, was illustrated in the November, 1920, number, page 338.

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LOADING FISH AT MACDUFF.

Fish Traffic on the Great North of Scotland Railway.

By G. E. LANE.

APART from tourist and a considerable amount of general passenger and industrial traffic, the area served being, on the whole, well populated and mostly under cultivation, the staple traffics on the Great North of Scotland Railway are agriculture and fish. The former applies more or less all the year round, according to the seasons. The latter, however, is more periodic in character, but at certain times involves very heavy traffic, calling for the running of numerous special trains. There are also associated features which possess considerable interest, while the traffic statistics and other particulars (for which we are indebted to Mr. G. Davidson, General Manager, and Mr. W. Johnston, Superintendent of the Line, Great North of Scotland Railway) afford illuminating evidence of the volume and character of this traffic.

Aberdeen itself, in regard to fish traffic, is mainly served by the Caledonian and North British Railways, most of the fish journeying southward, though the Great North Company is concerned in distribution over its lines radiating from Aberdeen in various directions. North of Aberdeen, however, and especially at Peterhead, Fraserburgh and at Buckie, and to a lesser extent at the numerous fishing ports which fringe the northern shores of Banffshire Macduff, Banff, Portsoy, Cullen, Portknockie, Findochty, Portessie, &c.—and at Lossiemouth, near Elgin, and at Boddam on the east coast of Aberdeenshire, the fish harvest is of primary importance to the district, and to the Great North of Scotland Railway, in that it has to deal with the direct and incidental traffic thus created. There is also a certain amount of traffic from ports west of Elgin, consigned via the Great North of Scotland Railway, to the south, while at times when there is fishing at Stornoway and other places on the west coast and little on the east coast, there are large consignments via the Highland and Great North of Scotland Railways for the Aberdeen fish merchants.

The three chief ports on the Great North of Scotland Railway are Fraserburgh, Peterhead and Buckie, all of which have

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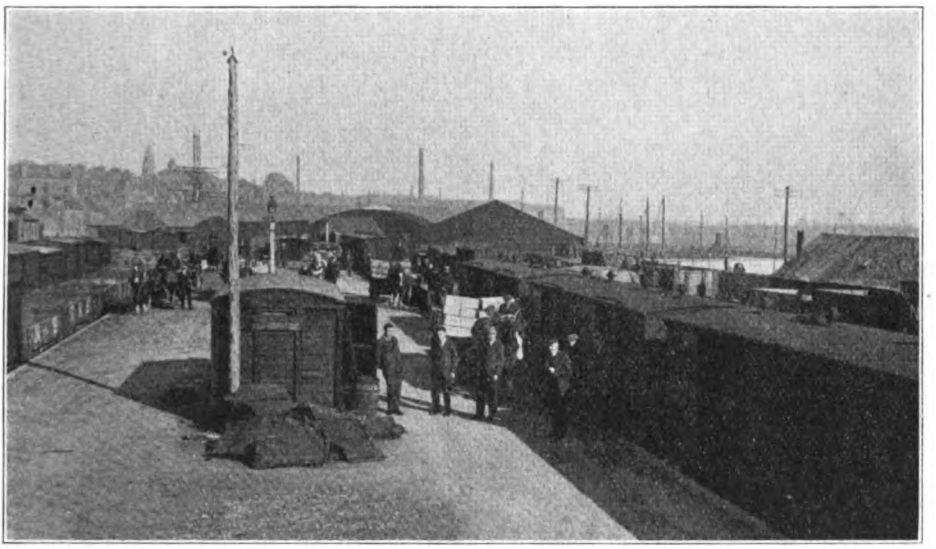
fine harbours capable of accommodating boats in large numbers, protected by massive sea walls from the winter violence of the North Sea, and having adjacent large fish-curing yards, repair shops, stores and premises owned by firms who cater for the fishing industry in various ways. Secondary to these three great harbours are Macduff and Lossiemouth, and there are smaller harbours at Boddam, Cullen, Whitehills (near Ladysbridge), Portknockie and Findochty.

During the winter months there is a steady traffic from all places, in cod and other white fish, haddocks, &c. This is usually dealt with by fish vans attached to ordinary passenger and goods trains. During the herring season (June to September), however, most of the boats concentrate at Fraserburgh and Peterhead, from which places numerous fish specials are then run. These places are largely concerned in supplying fish to the Edinburgh, Glasgow and English markets, also to coast and inland towns south of Aberdeen, served by the Caledonian and North British Railways, to which the trains are handed over at Aberdeen. At Fraserburgh and Peterhead, also at Buckie, there are extensive curing yards, and kippers are consigned in large numbers through to London, Liverpool, Manchester, &c. The traffic largely passes in consignments forwarded by firms at the places mentioned, fulfilling "customers' orders," a considerable proportion being sent by express passenger, express goods or special fast fish trains.

During the herring season there are usually three fish specials daily from Fraserburgh and three from Peterhead, others being run as required, while part of the traffic is attached to ordinary passenger and goods trains. Seeing that north of Dyce Junction, where the main line is left, the Peterhead and Fraserburgh lines (these unite at Maud Junction) are single track, it is no easy task at times to provide a path for these trains. Yet the three scheduled specials from Peterhead are booked to cover the 44¼ miles to Aberdeen, and to cross other trains as follows:—10.15 a.m., due 12.7 p.m., four crossings; 11.5 a.m., due 12.45 p.m., three crossings, and 2.10 p.m., due 4.15 p.m., five crossings, with a stop of 15 minutes at Maud Junction to attach a Fraserburgh section. Similarly, the two Fraserburgh specials are booked to cover the 47¼ miles as follows:—10.10 a.m., due 12.23 p.m., four crossings, and 11.3 a.m., due 1.10 p.m., four crossings, while at 2 p.m. there is a section to be attached to the 2.10 p.m. from Peterhead at Maud Junction.



LOADING FISH AT FRASERBURGH.

Most of the traffic is sent by these trains, all except the combined trains being

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arranged to connect with the 1.30 p.m. West Coast and 1.45 p.m. East Coast fish trains from Aberdeen for the south. But as the boats may come into the ports at any time, it is frequently necessary to run specials to suit them. At busy times it is often necessary, too, for the Caledonian and North British Railways to work the specials from the Great North of Scotland Railway through from Aberdeen as complete trains, except that a degree of re-marshalling is generally necessary at Aberdeen, in view of the fact that the specials usually include both West and East Coast vehicles. During the period when traffic is heavy it is by no

LOADING FISH AT BUCKIE.

means unusual for the specials to require the services of two engines regularly, while instructions have to be issued as to the methods of dealing with trains too long for certain of the crossing places.

As showing the volume of this traffic, the following statistics supplied by Mr. Davidson and Mr. Johnston will be of interest. During the last herring fishing period (June, July, August and September, 1922), no less than 10,960 tons were conveyed in 5,047 wagons by passenger trains, or as fish specials, the latter numbering 346, involving a total of 4,805 wagons and a tonnage of 9,610. By goods trains 379 wagons carried 1,211 tons, of which 350 wagons and 1,050 tons were conveyed during the period of the summer herring fishing. The grand total was 5,426 wagons and 12,171 tons, of which 5,155 wagons and 10,660 tons were consigned from Peterhead and Fraserburgh.

These statistics are notable, but they are considerably below those for 1921, and very much less than those of the later war years, when the English East Coast fishing ports were necessarily closed, so that ports north of Aberdeen had to accommodate most of the East Coast fishing industry, as far as it was then operative. Thus, in 1921, the herring traffic required the use of 5,482 wagons and provided a tonnage of 10,741, but in 1918 the number of vehicles was 12,304 and the tonnage 27,499, and in 1919 there were 8,840 wagons and 24,438 tons. Even in 1920 the totals were very high, 6,387 wagons and 15,497 tons. The figures given for 1922 are, however, fairly representative of the industry, except that, owing to the fact that the Russian and German markets are not now open, a large proportion of the fish was consigned to Scottish and English markets, and was thus conveyed by rail, whereas previously a considerable amount of fish, both fresh and cured, was re-consigned by water. The heaviest traffic on record for one day was on Tuesday, July 2, 1918, when 16 special trains, conveying 479

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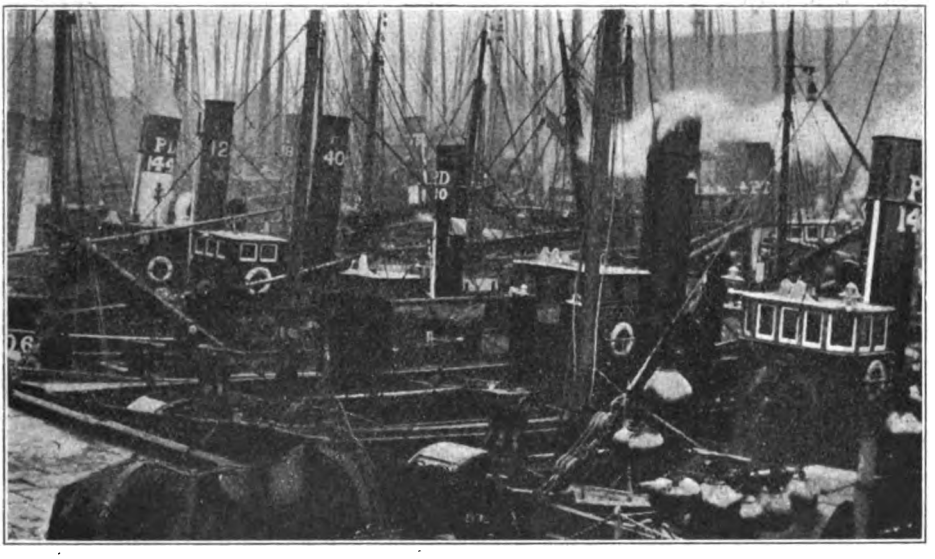
wagons, were run to Aberdeen from Peterhead and Fraserburgh, the total for all Great North of Scotland Railway stations being 505 wagons.

During the remainder of the year the traffic is more general, Buckie and other ports being concerned almost as much as Peterhead and Fraserburgh. From October, 1921, to May, 1922, there were 2,623 wagons (5,785 tons) by passenger trains, and 236 wagons (770 tons) by goods train; total, 2,859 wagons (6,555 tons). Of these, cod fishing at Lossiemouth and Buckie in February, March and April accounted for 647 wagons and 1,432 tons. Previous totals were:—

1916–17, 1,547 wagons (4,475 tons); 1917–18, 7,260 wagons (21,510 tons); 1918–19, 6,607 wagons (19,857 tons); 1919–20, 4,384 wagons (14,368 tons); and 1920–21, 4,249 wagons (9,235 tons).

During October and November a large number of the fishing boats go to Yarmouth and Lowestoft for the autumn herring fishing. At the same time, many firms transfer their activities to these places, and large numbers of fish workers, male and female, go to Lowestoft and Yarmouth, fares being paid and accommodation provided, with a guarantee of minimum earnings, by their employers. This migration commences about the end of September until the second week of October, the Scotch "lassies" and others returning home for Christmas and the New Year. Accommodation is reserved on certain trains from Aberdeen for the south, the workers usually travelling in parties, through coaches being provided direct to Yarmouth and Lowestoft. In 1920 about 3,700 persons thus travelled from Great North of Scotland Railway stations, and in 1921 about 3,500. When this great migration is in progress there are usually animated scenes, friends and relatives assembling in large numbers to see the travellers safely on their way.

Associated with the fishing industry



STEAM DRIFTERS, PETERHEAD HARBOUR.

there is, of course, considerable traffic in coal and oil for the fishing drifters, salt and general stores and materials for the firms incidentally concerned, as well as for the fishing craft and staff. Coal largely comes from the Fife coalfield. Ice is supplied in large quantities from Aberdeen. All along the Banffshire coast the chain of fishing villages is almost continuous, and there is a considerable local passenger traffic, many of the workers living in villages a few stations away, but travelling to and from Buckie or other centres for their work.

It will thus be seen that the fish traffic of the Great North of Scotland Railway

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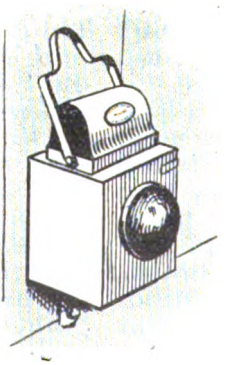
possesses many features of interest. Each of the stations specially named has a considerable number of sidings, and when the fish is being loaded the yards are busy

LOADING FISH AT PETERHEAD.

station yards are crowded, the one with fishing craft and the other with railway wagons, road vans and lorries, &c. In several instances some thousands of people

places, as the motor lorries and carts come along with the fish, which have to be booked and loaded according to destination and route. As will be gathered from the illustrations reproduced, both the harbours and the earn a living directly or indirectly from the fish harvest, but all demands are met by the Great North of Scotland Railway, and but rarely is there any delay on the railway side.



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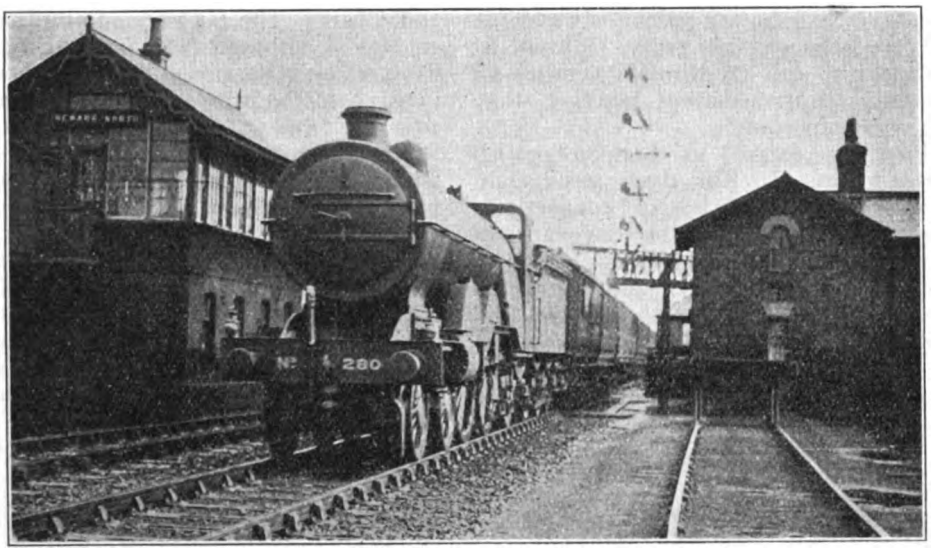

Photo.] GREAT NORTHERN RAILWAY. [*Henry L. Salmon.*

Down East Coast express passing Newark North Cabin. 4-4-2 locomotive, No. 280.

Anglo-Scottish Train Services, 1922-23.

By "INDICATOR."

AN important feature of Anglo-Scottish train services is their standard all-the-year-round character. Indeed, even when divided and amplified during the holiday and tourist seasons, the normal services still constitute the basis around which the additional and relief trains are arranged. In this article, therefore, the regular services are mainly considered, as scheduled during the 1922–23 winter period, with only occasional reference to special summer developments.

Public attention necessarily centres principally upon the standard day trains, such as the 10.0 a.m. expresses from Euston and King's Cross, the midday trains and the night sleeping car expresses, but even these together call for a dozen or so through trains each way daily between London and Scottish towns, and there are others which bring the total of Anglo-Scottish expresses crossing the border to about 30 daily each way. From London they number about 20, the majority serving Edinburgh and Glasgow, with through carriages to other parts of Scotland, but a few concerned only with traffic for Scottish destinations other than the political and industrial capital cities.

They are usually scheduled in groups, the day services leaving London in the morning and about midday, with corresponding services in the opposite direction, and with an elaborate series of night trains, mostly with sleeping cars, in view of the fact that business men can thus utilise the night for travel, and so avoid the waste of ordinary business hours for long-distance journeys. Manchester, Liverpool and Leeds also have important through services, more or less distinct from the London trains on the East and West Coast routes, though in the case of the Midland route Leeds is served directly, and only Manchester and Liverpool require consideration otherwise. Birmingham, Bristol and Plymouth have through carriage facilities, as also Exeter, Southampton, Harwich and, in the summer months, Scarborough, so that the subject selected for consideration goes considerably beyond a simple study of the through trains from and to London. There are also certain connections, even from and to

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London, which have a value for travelling purposes, though their traffic may not be sufficient to call for through vehicles all the way; intermediately, however, they are very important.

First in regard to London-Scottish through trains. The day's work commences with a series of connections, whose chief value is for the conveyance of parcels, etc., from London, becoming important for passenger and associated traffic between stations *en route* and Scotland. The earliest of these is the 4.25 a.m. from St. Pancras, which provides, by means of connections, for journeys to Edinburgh, Glasgow, Dundee, Perth, Aberdeen, Dumfries, Kilmarnock, &c. The 4.45 a.m. from King's Cross, which connects with the 9.0 a.m. Leeds–Glasgow East Coast through restaurant car express, enables Edinburgh to be reached at 1.45 p.m. (nearly five hours earlier than by the 10.0 a.m. through express from King's Cross), Glasgow at 3.10 p.m., Dundee at 3.41 p.m., Perth at 3.30 p.m., Aberdeen at 5.40 p.m., while it is also possible to reach Inverness and Fort William late the same evening. The 5.0 a.m. from Euston gives arrivals in Edinburgh at 4.5 p.m., Glasgow 4.22 p.m., and also serves Dundee, Aberdeen, Perth and Oban. The 6.45 a.m. from Euston enables Edinburgh to be reached at 6.0 p.m., and Glasgow at 6.5 p.m., though, in this case, the gain, as compared with the 10.0 a.m., due at 6.30 p.m. at each of the Scottish capital cities, is not great. Obviously, relatively few passengers would make through journeys by these trains, and their chief value is for intermediate traffic, but the travel possibilities they provide for are not always realised and are sufficiently important to call for attention.

Four standard trains are provided in the regular morning through service, all with restaurant car accommodation through-

Photo.] LONDON & NORTH WESTERN RAILWAY. [*J. Macartney Robbins.*

Down West Coast Express at Euston. 4-4-2 tank engine, No. 139 (pilot to Willesden Junction); four cylinder 4-6-0 locomotive, No. 2426, train engine.

out. In the case of the Midland route, Edinburgh and Glasgow are provided for separately, the 9.0 a.m. reaching Edinburgh (Waverley) at 6.34 p.m., and the 9.50 a.m. being due at Glasgow (St. Enoch) at 7.5 p.m. The former train has through carriages, combined at Edinburgh with those off the 10.0 a.m. from King's Cross, for Dundee and Aberdeen, giving also a good connection to Perth. The 10.0 a.m. from King's Cross has, during part of the year, a relief at 9.50 a.m., restricted to Edinburgh traffic. The standard 10.0 a.m. train, however, which runs all the year round, is due to reach Edinburgh at 6.30 p.m., and has a through section for

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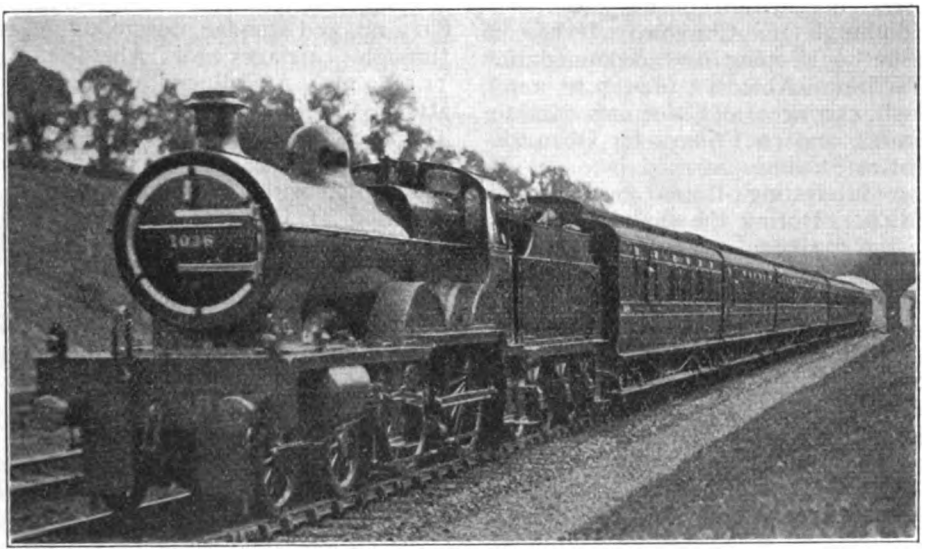
Dundee, due at 8.25 p.m., and Aberdeen at 10.26 p.m., with restaurant car accommodation north as well as south of Edinburgh. It also gives a connection to Perth, due 8.16 p.m. The 10.0 a.m. from Euston is necessarily a composite train, having restaurant cars on both the Edinburgh and Glasgow sections, while the through carriages from Euston to Aberdeen, detached at Symington, obtain the use of a first and third class Pullman restaurant car as far as Perth. The arrival in Edinburgh is the same as by the 10.0 a.m. from King's Cross, though the Euston train has an overwhelming advantage to Glasgow. The East Coast Pancras is due at Glasgow at 9.25 p.m. As the 1.30 p.m. from Euston reaches the Scottish capital cities only 55 minutes later than by the 10.30 a.m., that service is naturally not one of through importance, but the fact that it does provide for such travel (though not by through carriages) is worthy of comment. The 1.20 p.m. from King's Cross is exclusively an Edinburgh train, due 9.50 p.m., whereas the 1.30 p.m. from Euston is due at both Edinburgh and Glasgow at 10.10 p.m. The Euston train, however, besides being peculiarly a midday express for Glasgow, has also through vehicles for Perth and Aberdeen, though as these arrive in the



MIDLAND RAILWAY.

Anglo-Scottish Restaurant Car Express. Three-cylinder compound 4-4-0 locomotive, No. 1036.

train gives the earlier arrival at Dundee, 8.25 p.m., as compared with 9.0 p.m., while it has a 7-minute advantage to Aberdeen. The West Coast train reaches Perth 6 minutes earlier than by the East Coast route.

After these trains have left, it is still possible, before the midday series of trains, to reach Edinburgh and Glasgow by the 10.30 a.m. from Euston, the Glasgow and Edinburgh arrival times being 9.15 p.m. The Edinburgh arrival is, however, improved upon by the first of the midday series of trains, the 11.45 a.m. from St. Pancras, due at Edinburgh (Waverley) at 9.1 p.m., while the 12.15 p.m. from St. "small hours" their value is more for parcels and incidental traffic.

The evening series of trains commences with the two 7.30 p.m. expresses, respectively from King's Cross and Euston. Both of these are, during part of the year, double trains, the Highland sleeping cars and through vehicles being run separately from those to Dundee and Aberdeen, the latter leaving the London termini five or eight minutes after the first section has left, though both portions are advertised as departing at 7.30 p.m. During the winter months, however, one train only is run in each case. The East Coast train has a dining car as far as Grantham, and

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conveys sleeping cars for Glasgow, Aberdeen, Perth and Inverness. It calls at Edinburgh (Waverley) at 3.50 a.m., a ten-minutes advantage on the standard 8½ hours between London and Edinburgh by other services, but does not convey Edinburgh traffic from London. The Glasgow section is due at 5.30 a.m., but has sleeping cars only on Friday nights, as also the Fort William sleeping car and through carriage. The Highland section is due at Perth 5.35 a.m., and Inverness 10.15 a.m., travelling north from Perth combined with the Inverness portion of the 7.30 p.m. from Euston. The Aberdeen portion is due at 7.30 a.m., Dundee 5.33 a.m. The 7.30 p.m. from Euston is concerned only with traffic for places north of Edinburgh and Glasgow. It has, in addition to sleeping car accommodation for Perth and Aberdeen (due 7.40 a.m.), through carriages and sleeping cars for Inverness, and on Fridays for Oban, detached at Stirling.

Two interesting trains next require attention. During the summer months, while the 7.30 p.m. from Euston runs in two parts, the Stranraer through carriage and sleeping car are attached to the second part, but during the winter months it is conveyed by the 7.50 p.m. from Euston, a train which is otherwise not concerned with Anglo-Scottish traffic. The 8.25 p.m. from King's Cross is one of those secondary trains which has important intermediate work to do, but is not usually considered from the through traffic point of view. It gives, however, an arrival at Edinburgh at 6.6 a.m., with through carriages, and provides for arrivals in Glasgow at 7.32 a.m., and Dundee 8.44 a.m. by connections.

The late evening services next call for consideration. The first is the 9.15 p.m. from St. Pancras, due in Edinburgh (Waverley) at 7.11 a.m., and with through carriages for Dundee and Aberdeen conveyed by a breakfast car express from Edinburgh northward in combination with the Dundee and Aberdeen section of the 10.20 p.m. from King's Cross. The 9.20 p.m. from Euston is exclusively a sleeping car express for Glasgow, due 6.55 a.m., while the 9.30 p.m. from St. Pancras is similarly a sleeping car express for Glasgow, due in St. Enoch at 7.30 a.m. The 10.20 p.m. from King's Cross does not serve Edinburgh for traffic from London, though it calls at Waverley station for traffic from Edinburgh northwards. It has a through sleeping car section for Glasgow, due 9.0 a.m., and conveys also a Dundee through carriage and sleeping car detached at Tay Bridge station. It also conveys a through sleeping car from London to Perth. North of Edinburgh, the through carriage and sleeping car from Dundee, and through carriages to Aberdeen, are attached to a breakfast car express from Edinburgh. The 10.30 p.m. from King's Cross is exclusively a sleeping car train for Edinburgh, due at Waverley station 7.42 a.m. The corresponding trains from Euston leave respectively at 11.0 and 11.40 p.m. The former is a sleeping car train for Edinburgh, due 8.0 a.m., and Dundee, due 10.5 a.m., with through carriages for Aberdeen, due 11.50 a.m. A Pullman breakfast car is attached between Carstairs and Perth. The 11.40 p.m. from London is exclusively a sleeping car express for Glasgow, due 9.35 a.m., with Pullman breakfast car attached at Carlisle. The 11.45 p.m. sleeping car train from St. Pancras is due, however, at St. Enoch at 9.0 a.m., with a restaurant car attached at Carlisle.

In dealing with these services, it will be interesting to consider their comparative value for traffic between London and the principal Scottish destinations. On the basis of earliest arrivals the trains from London are as follows :—

London (dep.).		Edinburgh (arr.).	
King's X..	4.45 a.m.	Waverley	1.45 p.m.
Euston ..	5.0 ,,	Princes St.	4.5 ,,
Euston ..	6.45 ,,	Princes St.	6.0 ,,
King's X..	10.0 ,,	Waverley	6.30 ,,
Euston ..	10.0 ,,	Princes St.	6.30 ,,
St. Pancras	11.45 ,,	Waverley	9.1 ,,
King's X..	1.20 p.m.	Waverley	9.50 ,,
Euston ..	1.30 ,,	Princes St.	10.10 ,,
King's X..	8.25 ,,	Waverley	6.6 a.m.
St. Pancras	9.15 ,,	Waverley	7.11 ,,
King's X..	10.30 ,,	Waverley	7.42 ,,
Euston ..	11.0 ,,	Waverley	8.0 ,,

London (dep.).		Glasgow (arr.).	
King's X..	4.45 a.m.	Queen St.	3.10 p.m.
Euston ..	5.0 ,,	Central ..	4.22 ,,
Euston ..	6.45 ,,	Central ..	6.5 ,,
Euston ..	10.0 ,,	Central ..	6.30 ,,
Euston ..	10.30 ,,	Central ..	9.15 ,,
St. Pancras	12.15 p.m.	St. Enoch	9.25 ,,
Euston ..	1.30 ,,	Central ..	10.10 ,,
King's X..	7.30 ,,	Queen St.	5.30 a.m.
King's X..	8.25 ,,	Queen St.	7.32 ,,
Euston ..	9.20 ,,	Central ..	6.55 ,,
St. Pancras	9.30 ,,	St. Enoch	7.30 ,,
King's X..	10.20 ,,	Queen St.	9.0 ,,
St. Pancras	11.45 ,,	St. Enoch	9.0 ,,

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London (dep.).		Dundee (arr.).	
King's X..	4.45 a.m.	Tay Bridge	3.41 p.m.
Euston ..	5.0 ,,	West ..	7.22 ,,
King's X..	10.10 ,,	Tay Bridge	8.25 ,,
King's X..	7.30 p.m	Tay Bridge	5.33 a.m.
King's X..	8.25 ,,	Tay Bridge	8.44 ,,
King's X..	10.20 ,,	Tay Bridge	9.23 ,,
Euston ..	11.0 ,,	West ..	10.5 ,,

London (dep.).		Aberdeen (arr.)	
King's X..	4.45 a.m.	Due	5.40 p.m.
Euston ..	5.0 ,,	,,	9.5 ,,
King's X..	10.0 ,,	,,	10.26 ,,
Euston ..	1.30 p.m.	,,	3.0 a.m.
King's X..	7.30 ,,	,,	7.30 ,,
King's X..	10.20 ,,	,,	11.24 ,,
Euston ..	11.0 ,,	,,	11.50 ,,

To Inverness the journey can be made in one day by the 4.45 a.m. from King's Cross, Inverness being reached at 8.12 p.m. By the 1.30 p.m. from Euston it is possible to arrive at the capital of the Highlands at 6.0 a.m. next day. The principal services, however, are those by the two 7.30 p.m. trains, respectively, from King's Cross and Euston, in each case with through carriages and sleeping cars. It is also possible to utilise the 11.0 p.m. from Euston, due at Inverness at 4.42 p.m. next day. The 4.45 a.m. from King's Cross enables Fort William to be reached at 8.14 p.m., and the 5.0 a.m. from Euston, Oban at 9.50 p.m., though the 7.30 p.m. trains from London are naturally the most important for both destinations. By the 11.0 p.m. from Euston passengers for Oban can be at their destination at 4.45 p.m. next day.

In the opposite direction the principal day services are the 10.0 a.m. from Glasgow (Central) and Edinburgh (Princes Street), due at Euston 6.30 p.m.; the East Coast train from Aberdeen 6.15 a.m., Dundee 8.9 a.m., Perth 8.30 a.m., Glasgow (Queen Street) 8.40 a.m., and Edinburgh (Waverley) 10.0 a.m., due King's Cross 6.30 p.m.; the 9.25 a.m. from Glasgow (St. Enoch) to St. Pancras, due 6.35 p.m.; the 9.45 a.m. from Edinburgh (Waverley) to St. Pancras, due 7.15 p.m. (this has a connection from Dundee (Tay Bridge) at 7.15 a.m.); the West Coast train from Aberdeen at 6.30 a.m., Dundee (West) 8.0 a.m., and Perth 9.0 a.m., due in Euston at 7.30 p.m.; the 10.40 a.m. from Edinburgh (Waverley) to St. Pancras, due 7.55 p.m. (with through carriages from Aberdeen, combined with the 6.15 a.m. East Coast train; the 12.0 noon from Glasgow (St. Enoch) to St. Pancras, due 9.15 p.m.; the 1.30 p.m. trains from Glasgow (Central) and Edinburgh (Princes Street), now accelerated to reach Euston at 10.0 p.m.; the East Coast train from Aberdeen at 9.50 a.m., leaving Dundee at 11.45 a.m., Perth 12.15 p.m., Glasgow (Queen Street) 12.10 p.m., Edinburgh (Waverley) at 1.40 p.m., and due at King's Cross 10.10 p.m.; and the West Coast train from Aberdeen at 10.5 a.m., Dundee (West) 11.40 a.m., and Perth 12.22 p.m., reaching Euston at 10.45 p.m.

A semi-fast train, due at King's Cross at 3.25 a.m., connects with the 4.0 p.m. Glasgow-Leeds East Coast train, but, speaking generally, has no value for London traffic as compared with later trains. The next arrival in London is that of the 5.0 a.m. at Euston, connecting with the 5.30 p.m. expresses from Glasgow (Central) and Edinburgh (Princes Street) the previous day, also with the 12.30 p.m. from Aberdeen, and having various connections. The 7.40 p.m. from Edinburgh (Waverley), due King's Cross 6.0 a.m., connects with the 3.35 p.m. from Aberdeen, and with various Scottish train services in connection.

The principal night sleeping car trains are those due at Euston 6.55 a.m., with through carriages on Mondays from Oban at 5.0 p.m., and daily from Inverness at 3.30 p.m., with a connection from Dundee (West) at 7.15 p.m., and connecting also with the 9.30 p.m. from Glasgow (Central) (sleeping car to London), and the 9.30 p.m. from Edinburgh (Princes Street); the 7.30 a.m. at King's Cross, with through carriages from Inverness (on Mondays from Fort William at 4.15 p.m.), and leaving Edinburgh (Waverley) at 10.30 p.m.; the 7.30 a.m. at Euston, the special sleeping car express from Edinburgh and Glasgow at 10.30 p.m.; the 7.35 a.m. at King's Cross, the through sleeping car express from Aberdeen at 7.15 p.m., and with a sleeping car and through carriage attached at Dundee (Tay Bridge) at 9.4 p.m.; the 8.0 a.m. at Euston, through sleeping car express from Aberdeen at 7.30 p.m., and Dundee 9.0 p.m.; and the 8.3 a.m. at St. Pancras, with sleeping car from Edinburgh (Waverley) at 9.50 p.m., and through carriages from Aberdeen at 5.45 p.m.

Associating these services, the fastest

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may be selected, as in the case of those in the down direction.

EDINBURGH (dep.).		LONDON (arr.).	
Princes St.	10.0 a.m.	Euston ..	6.30 p.m.
Waverley	10.0 ,,	King's X..	6.30 ,,
Waverley	10.40 ,,	St. Pancras	7.55 ,,
Princes St.	1.30 p.m.	Euston ..	10.0 ,,
Waverley	1.40 ,,	King's X..	10.10 ,,
Waverley	5.15 ,,	King's X..	3.25 a.m.
Princes St.	5.30 ,,	Euston ..	5.0 ,,
Waverley	7.40 ,,	King's X..	6.0 ,,
Princes St.	9.20 ,,	Euston ..	6.55 ,,
Waverley	10.30 ,,	King's X..	7.30 ,,
Princes St.	10.30 ,,	Euston ..	7.30 ,,

GLASGOW (dep.)..		LONDON (arr.).	
Central ..	10.0 a.m.	Euston ..	6.30 p.m.
St. Enoch	12.0 noon	St. Pancras	9.15 ,,
Central ..	1.30 p.m.	Euston ..	10.0 ,,
Queen St.	4.0 ,,	King's X..	3.25 a.m.
Central ..	5.30 ,,	Euston ..	5.0 ,,
Queen St.	6.0 ,,	King's X..	6.0 ,,
Central ..	9.30 ,,	Euston ..	6.55 ,,
Central ..	10.30 ,,	Euston ..	7.30 ,,
St. Enoch	10.45 ,,	St. Pancras	7.50 ,,

DUNDEE (dep.).		LONDON (arr.).	
Tay Bridge	8.9 a.m.	King's X..	6.30 p.m.
Tay Bridge	11.45 ,,	King's X..	10.10 ,,
Tay Bridge	2.50 p.m.	King's X..	3.25 a.m.
Tay Bridge	5.33 ,,	King's X..	6.0 ,,
West ..	7.15 ,,	Euston ..	6.55 ,,
Tay Bridge	7.43 ,,	King's X..	7.30 ,,
Tay Bridge	9.4 ,,	King's X..	7.35 ,,
West ..	9.0 ,,	Euston ..	8.0 ,,

ABERDEEN (dep.).	LONDON (arr.).	
6.15 a.m.	King's X..	6.30 p.m.
6.30 ,,	Euston ..	7.30 ,,
9.50 ,,	King's X..	10.10 ,,
10.5 ,,	Euston ..	10.45 ,,
12.50 p.m.	King's X..	3.25 a.m.
3.35 ,,	King's X..	6.0 ,,
5.45 ,,	King's X..	7.30 ,,
7.15 ,,	King's X..	7.35 ,,
7.30 ,,	Euston ..	8.0 ,,

From Inverness London can be reached by the 8.40 a.m. train at 10.10 p.m., King's Cross; by the 10.30 a.m., at Euston 5.0 a.m. next morning; while the 11.20 p.m. connects with the East and West Coast trains due next day at King's Cross 6.30 p.m. and Euston 7.30 p.m. The principal service is, however, that by the 3.30 p.m. from Inverness, with through sleeping cars to both Euston and King's Cross, the earlier arrival being at Euston 6.55 a.m. Oban has its best service at 5.0 p.m., with a through carriage and sleeping car to Euston on Mondays, though it is possible to make the journey in the day by the 5.40 a.m. from Oban, due Euston 7.30 p.m., and the 9.10 a.m., due Euston 10.45 p.m., the 11.50 a.m. giving an arrival at 5.0 a.m., nearly two hours in advance of the 5.0 p.m. through service. The principal through service from Fort William is on Mondays at 4.15 p.m. In the up direction the through carriage from Stranraer to Euston at 9.55 p.m. is combined with the 7.30 p.m. from Aberdeen at Carlisle, due in Euston at 8.0 a.m.

Dealing now with Anglo-Scottish train services other than those to and from London, principal interest attaches to those between Liverpool and Manchester and Edinburgh and Glasgow. Many of these are run independently of the London trains for part of the journey, if not throughout. By the Midland route good connections are provided with several of the London-Scottish trains via Hellifield, but only one train each way has through carriages, the 9.20 a.m. from Manchester (Victoria) to Glasgow, and the 12.0 noon from Glasgow (St. Enoch) to Manchester (Victoria). Otherwise, all principal services are associated with the West Coast route. Of these the most important are the 9.40 a.m. from Manchester (Victoria) and the 9.47 a.m. from Liverpool (Exchange), with through carriages and restaurant car accommodation, and due at Glasgow (Central) and Edinburgh (Princes Street) at 3.20 p.m. Corresponding trains leave Manchester (Victoria) at 12.30 and 3.0 p.m., the Liverpool (Exchange) departures being 12.40 and 3.20 p.m., and the arrivals at Glasgow (Central) 6.5 and 9.15 p.m., and at Edinburgh (Princes Street) 6.0 and 9.15 p.m. There is also a fourth train from Manchester (Exchange) at 5.0 p.m., and Liverpool (Exchange) 5.8 p.m., due at both Scottish termini at 11.0 p.m. In the opposite direction through vehicles for Liverpool (Exchange) and Manchester (Victoria) are conveyed by the 10.0 a.m. from Edinburgh (Princes Street), but the Glasgow sections are run separately on the 10.10 a.m. from Glasgow (Central), the arrivals in Liverpool and Manchester being 15 or 20 minutes later than those from Edinburgh. The corresponding sections for Liverpool and Manchester are attached to the 1.30 p.m. London trains from Edinburgh and Glasgow, while at 4.10 p.m. through expresses for Liverpool and Manchester leave Glasgow and Edinburgh. A late service is given attached to the 10.30 p.m. from Edinburgh (Princes Street), due at Liver-

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pool (Lime Street) at 6.0 a.m., and by the 11.10 p.m. from Glasgow (Central), with a sleeping car to Liverpool (Lime Street) and through carriages to Manchester (Exchange).

Several other trains have connections or through carriages. Thus, the 12.45 a.m. from Liverpool (Lime Street) has a sleeping car for Glasgow (Central), although it is possible to make the same arrival by the 1.50 a.m. from Liverpool (Exchange) and by the 1.10 a.m. from Manchester (Exchange), though without through carriages. The 10.40 p.m. from Liverpool (Lime Street) and 10.55 p.m. from Manchester (Exchange) connect with the 7.30 p.m. from Euston for Aberdeen, etc. Connections by the Midland route provide services joining the London through trains, from Manchester (Victoria) at 11.25 a.m. (12.20 p.m. on Saturdays), and Liverpool (Exchange) at 11.15 a.m., giving an arrival in Glasgow (St. Enoch) at 7.5 p.m., and at 2.50 p.m. from Manchester (Victoria), and 2.53 p.m. from Liverpool (Exchange), due Glasgow (St. Enoch) 9.25 p.m.

In the opposite direction the Midland route provides additional services, including those by connections with London trains. The 10.40 a.m. from Edinburgh (Waverley) and 12 noon from Glasgow (St. Enoch), is due at Liverpool (Exchange) 6.23 p.m. and Manchester (Victoria) 6.27 p.m. (through carriages), while the 5.30 p.m. trains from Glasgow (Central and St. Enoch) and Edinburgh (Princes Street and Waverley) at 6 p.m. give arrivals at Liverpool (Lime Street) at 12.45 a.m. and Manchester (Victoria) 12.18 a.m.

By the Midland route Leeds obtains a number of through expresses, with restaurant or sleeping cars, to and from Edinburgh and Glasgow, in that Leeds is on the direct route and therefore obtains the benefit of all through expresses from and to London. Thus, to Glasgow, trains from the Wellington Station at Leeds at 10.18 a.m., 1.53 and 4.15 p.m., and 2.10 a.m. give arrivals at Glasgow (St. Enoch) respectively at 3.40, 7.5 and 9.25 p.m. and 7.30 a.m. Similarly, the 10.18, 1.30, 4.5 p.m. and 1.52 a.m. trains give arrivals at Edinburgh (Waverley) at 3.54, 6.34 9.1 p.m. and 7.11 a.m. The Edinburgh trains give good connections and, in some instances, through carriages for Dundee and Aberdeen. In the opposite direction trains for Leeds leave Glasgow (St. Enoch) at

Photo.] NORTH EASTERN RAILWAY. [*C. J. L. Romanes.*

10 a.m. Edinburgh–King's Cross Restaurant Car Express.
Three-cylinder 4-4-2 locomotive, No. 720.

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9.25 a.m., 12 noon, 5.30, 9.20 and 10.45 p.m., and Edinburgh (Waverley) at 9.45 10.40 a.m., 6.0 and 9.50 p.m.

Leeds also obtains the benefit of its numerous connections with East Coast trains, giving services from Leeds (New) at 8.55 a.m., 1.5, 1.55, 4.5 and 10.45 p.m., all of these trains, except the 4.5, serving also Glasgow. The best is, of course, the 8.55 a.m restaurant car express from Leeds to Glasgow, due at Edinburgh (Waverley) 1.45 p m. and Glasgow (Queen Street) 3.10 p.m. Return trains leave Glasgow at 8.40 a.m., 12.10, 1.0, 4.0 and 9.30 p.m., and Edinburgh (Waverley) at 10.0, 10.15, 10.25 a.m., 1.22, 1.40, 2.30 5.15 and 10.30 p.m., the best being the return through restaurant car express from Glasgow at 4.0 p.m. and Edinburgh 5.15 p.m.

Other through services associated with Anglo-Scottish trains are the 5.25 p.m. from Exeter (Great Western Railway) and Bristol 7.20 p.m., via Hereford, and due at Glasgow (Central) 7.40 a.m.; the 11 a.m. from Birmingham (New Street) via Crewe, due Glasgow (Central) and Edinburgh (Princes Street) 6.30 p.m.; the 8.40 a.m. from Plymouth, and 12.32 p.m. from Bristol, via Hereford, due Glasgow (Central) 10.10 p.m.; the corresponding through services from Glasgow (Central) at 10 a.m. to Birmingham, Bristol, Exeter and Plymouth, and by the 5.30 p.m. to Exeter; the 8.40 a.m. from Plymouth (Great Western Railway) to Aberdeen, and the return service from the Granite City at 12.30 p.m.; the through services by the Midland route from Bristol at 10.25 a.m., returning from Glasgow on the 9.25 a.m. from St. Enoch, a through carriage from Glasgow to Nottingham on the latter train; and the now famous Aberdeen–Penzance service leaving Aberdeen at 9.50 a.m. and Penzance at 11 a.m., together with the new Glasgow (8.40 a.m.) and Edinburgh (10.15 a.m.) service to Southampton (due 10.46 p.m.) and Harwich (due 9.38 p.m.), and the corresponding return train from Harwich at 8.2 a.m., and Southampton 7.35 a.m.

There are, of course, many associated facilities, and numerous other connections can be made, particularly in cases where only one or two through services are provided daily, but, in the aggregate, it will be seen that the importance of the Anglo-Scottish train services extends much beyond that of the through trains from and to London, especially when it is also taken into account that the stations served, either by the through trains or by trains in connection, are themselves centres for associated traffic. There is no need to consider the special features or peculiarities of the individual trains, as these will be appreciated by examining the time-tables, and the main features will be known to most of our readers. Variations on Saturday and Sunday nights are not taken into account.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE NINETEENTH CENTURY.

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Under this heading Mr. E. L. Ahrons will deal with the Locomotives and Trains of the

RHYMNEY RAILWAY

in the forthcoming RAILWAY MAGAZINE, February, 1923.

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Rise and Progress of the Glasgow & South Western Railway.

WE have on several occasions dealt with the principal facts concerning this interesting line, familiarly known in Scotland as the "South Western," but we have been favoured with a carefully prepared *résumé* of the growth and development of this important company, the third largest in Scotland, and in view of its forthcoming absorption into the North Western, Midland and West Scottish group, the following notes, in conjunction with general remarks and incidental references to various aspects, are peculiarly apposite at this time.

The Glasgow and South Western Railway was constituted on November 1, 1850, on the amalgamation of the Glasgow, Paisley, Kilmarnock and Ayr and Glasgow, Dumfries and Carlisle Railways, the now familiar appellation being then adopted. The parent companies had been in existence for some years previous, the Parliamentary Bill for the Glasgow, Paisley, Kilmarnock and Ayr Railway having been passed on July 15, 1837, and for the Glasgow, Dumfries and Carlisle Railway on August 13, 1846. The line between Glasgow and Ayr was opened in 1840, the line between Kilmarnock and Carlisle being completed ten years later, its opening throughout being the justification for the amalgamation and change of title above mentioned. As a railway company, therefore, the Glasgow and South Western ranks amongst the oldest in the country. It has, however, further claims in regard to pioneer railway construction, in that the first railway in Scotland—the Kilmarnock and Troon, opened in 1811—forms a part of its system. This railway, which was constructed by the Duke of Portland for the transportation of coal from his estates to the harbour at Troon, was originally worked by horse haulage, but in 1817 a locomotive engine, supplied by Stephenson, and said to be the second he had built, was employed to work the line. It is on record that the "Iron Horse" was not at first a success, owing to the damage it caused the cast-iron rails, horse haulage having to be reverted to, but afterwards the substitution of wooden for iron wheels on the engine enabled it to again take up the working of the line, on which duty it was engaged for many years.

In connection herewith it may be interesting to quote from "Duncan's Itinerary of Scotland," published in 1827, the following descriptive remark :—

"The Troon Rail Road rises about 80 or 84 feet from Troon to Kilmarnock, or 1/16th of an inch per yard. The road is double, with an intermediate space for the drivers, and at different distances sliders, turning upon pivots, admit of a waggon changing from the one road to the other. Carriages made to run on the rail way pass once or twice a-day to and from Troon, which has now become a fashionable Sea-bathing town."

The Glasgow and South Western Company held its first meeting in March, 1851, when the lines then opened—Glasgow to Ayr, Dalry to Gretna Junction, Kilmarnock to Troon, Hurlford to Newmilns, Auchinleck to Muirkirk, Paisley to Renfrew, and some mineral lines—represented a total mileage of 174¾ miles. There was also the Ardrossan Railway, constructed by the Glasgow, Paisley and Ardrossan Canal Company, connecting at Kilwinning. To-day the mileage of the railway amounts to 493 miles 36 chains, which reckoned in single track (including sidings) represents 1,143 miles 4 chains.

The Kilmarnock and Troon Parliamentary Bill was passed in 1808, and the line opened for horse haulage in 1811. The first locomotive engine in Scotland started on this line early in 1817, constructed by George Stephenson to the order of the Duke of Portland, to whom the railway belonged. The line was taken over on lease by the Glasgow, Paisley, Kilmarnock and Ayr Railway in November, 1845, and was vested in the Glasgow and South Western Railway in 1899.

The Paisley and Renfrew Railway was opened on April 3, 1837, and was taken over by the Glasgow, Paisley, Kilmarnock and Ayr Railway Company in November, 1846.

In 1805 an Act of Parliament was obtained by the Earl of Eglinton for the

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construction of a harbour at Ardrossan, and a canal to Glasgow. The first portion of the canal, from Johnstone to Paisley, was opened on November 6, 1810, and from Paisley to Glasgow on November 4, 1811, the remainder of the scheme being abandoned. The canal was taken over by the Glasgow and South Western Railway Company in 1869, and later the section between Port Eglinton and Elderslie was converted into a railway, opened in June, 1885.

The Kilwinning and Ardrossan Railway, constructed by the Glasgow, Paisley and Ardrossan Canal Company, was opened

Dalry to Kilmarnock ..	April 4, 1843.
Irvine Harbour Branch ..	March 1, 1847.
Irvine and Busby Branches	May 22, 1848.
Kilmarnock to Auchinleck ..	August 9, 1848.
Auchinleck to Muirkirk ..	August 9, 1848.
Hurlford to Galston ..	August 9, 1848.
Dumfries to Gretna	August 23, 1848.
Closeburn to Dumfries ..	October 15, 1849.
Auchinleck to New Cumnock	May 20, 1850.
Galston to Newmilns ..	May 20, 1850.
New Cumnock to Closeburn	October 28, 1850.

The Ardrossan Railway referred to above, opened in 1840, was taken over in 1854; the Ayr and Dalmellington Railway, opened in 1856, was taken over in 1858; the Ayr and Maybole Railway, opened for goods traffic on September 15,

Photo.] [*C. J. L. Romanes.*

DUMFRIES-GLASGOW TRAIN LEAVING SANQUHAR.

Rebuilt 4-4-0 locomotive, No. 716.

in 1840, with branches to Dubbs, Doura and Fergushill. The Glasgow, Paisley, Kilmarnock and Ayr Company entered into negotiations for the purchase of the Ardrossan line in 1846, but did not take it over till August 1, 1854.

The following are the dates of opening of the principal lengths of lines acquired by the Glasgow and South Western Railway on its being constituted in the year 1850.

Ayr to Irvine	August 5, 1839.
Irvine to Kilwinning ..	March 20, 1840.
Kilwinning to Beith	July 5, 1840.
Glasgow and Paisley (Joint Line)	July 13, 1840.
Beith to Paisley	August 12, 1840.

1856, and for passengers on October 13, 1857. The Maybole and Girvan Railway was opened on May 24, 1860, and taken over on July 5, 1865; the Dumfries and Castle Douglas Railway was opened on November 7, 1860, and taken over on July 5, 1865. The Bridge of Weir Railway (from Johnstone to Bridge of Weir) was opened in April 1864, and taken over in 1865. The Greenock and Ayrshire Railway (from Bridge of Weir to Greenock) was opened in 1869. At the same time a short line was opened between Elderslie on the main line and Cart Junction on the Bridge of Weir branch of the Glasgow and South

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Western Railway, thereby providing a direct route between Glasgow and Greenock. This was worked by the Glasgow and South Western Railway until, in 1872, the Greenock and Ayrshire Line was taken over.

The City Union Railway, which had for its object to connect the North British Railway at Springburn with the Glasgow and South Western Railway at Pollokshields, was completed in August, 1875. This line, the joint property of the two companies concerned, was apportioned between them in 1896, the North British taking over the portion between Springburn and College East, and the Glasgow and South Western the part between College East and Pollok Junction.

The Ayr and Mauchline line was opened on September 1, 1870, and the Ayr, Cumnock and Muirkirk line on July 1, 1872. The Glasgow, Barrhead and Kilmarnock direct line, jointly owned with the Caledonian Company, was opened throughout on June 26, 1873. St. Enoch Station was opened by King Edward VII, when Prince of Wales, in 1876. The well-known St. Enoch Station Hotel was brought into use in 1879. The Ardrossan to West Kilbride line was opened in 1878, and extended to Fairlie in 1880, to Fairlie Pier in 1882, and to Largs in 1885. In 1885, also, the Glasgow, Paisley and Johnstone Canal was filled in, as already mentioned, and a railway, known as the Canal line, constructed in its place and brought into use.

The Glasgow and Renfrew District Railway (jointly owned with the Caledonian Company) was brought into use on June 1, 1903, and the same year saw the opening of the Catrine branch. On March 1, 1905, the Cairn Valley Light Railway from Dumfries to Moniaive, and on May 17, 1906, the Maidens and Dunure Light Railway from Ayr to Girvan, were opened. At Turnberry, a station on the latter line, and a notable golfing centre, the company owns a magnificent hotel. In 1906 the North Johnstone and Dalry line also was opened, this line being in the nature of a relief line to the existing main line between Johnstone and Dalry, which was becoming inadequate to carry the increasing traffic. There are two lines of double track between Glasgow and Kilwinning Junction, where the lines for Ayr and Ardrossan diverge. At present, however, the $2\frac{3}{4}$ miles of duplicate lines between Dalry Junction and Kilwinning Junction are open for goods trains only.

A few further remarks in regard to certain of these lines may here be given.

A small portion of the Ayr and Dalmellington Railway, opened on August 17, 1856, and taken over by the Glasgow and South Western Railway Company on July 27, 1858, had been constructed by the Dalmellington Iron Company as early as 1853, an Act of Parliament providing for connection with the Glasgow and South Western Railway, being passed on August 4, 1853. The Ayr Townhead station was opened on July 1, 1857.

The Castle Douglas to Stranraer Railway was opened on March 12, 1861, and the Stranraer to Portpatrick section in 1862. The Castle Douglas to Kirkcudbright section was opened on March 17, 1864.

An Act of Parliament for the Bridge of Weir Railway was passed in 1846, but the scheme was at that time abandoned. A new Act was passed in 1862 for the present line from Johnstone to Bridge of Weir, and this was opened on April 25, 1864, for mineral traffic, and on June 20 of the same year for passenger traffic, being taken over by the Glasgow and South Western Railway on September 14, 1865.

The Greenock and Ayrshire Railway Act, which authorised an extension of the line from Bridge of Weir to Greenock, was passed on July 5, 1865, the Glasgow and South Western Railway Company undertaking to work the line when completed and to receive 30 per cent. of receipts for working expenses. At the same time the Glasgow and South Western Railway Company obtained powers for construction of a line from their main line between Paisley and Johnstone to the Bridge of Weir line. The Greenock and Ayrshire line was opened for mineral traffic on September 1, for goods traffic on October 1, and for passenger traffic on December 23, 1869. It was incorporated with the Glasgow and South Western system from August 1, 1872.

A Parliamentary Bill for the Girvan and Challoch Junction line was passed on July 5, 1865. Construction was commenced in 1871, traffic being inaugurated on October 1, 1876. A line from Brackenhill

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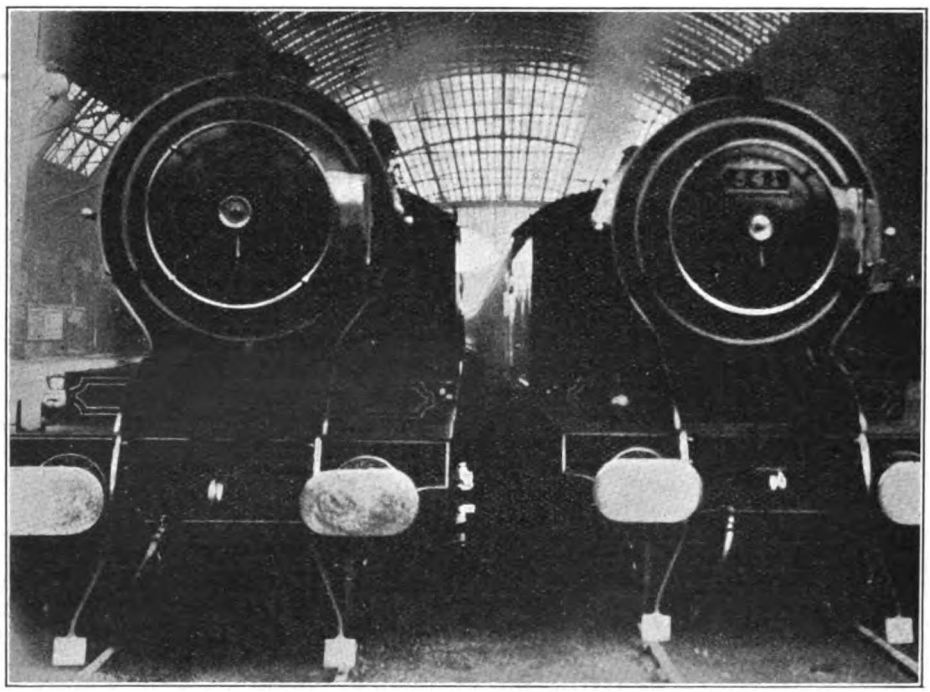
to Catrine was among other short branches authorised as early as 1847, but was abandoned, until the present line was constructed and opened for traffic on September 1, 1903. The Darvel and Strathaven line was opened on July 4, 1904.

The lines belonging to the company radiate from Glasgow to the south and west of Scotland, embracing Paisley, Renfrew, Greenock, Kilmarnock, Dumfries, and the Ayrshire coast towns of Largs, Fairlie, West Kilbride, Ardrossan, Saltcoats, Stevenston, Irvine, Troon, Prestwick, Ayr and Girvan. South of Girvan the line continues to Stranraer and connects with the Portpatrick and Wigtownshire Joint Railway, serving the south-west of Scotland between Portpatrick and Castle Douglas, at which latter point junction is formed with the Glasgow and South Western line to Dumfries and the main route to Carlisle.

Stranraer is the chief port in the South of Scotland, between which and Larne, in the north of Ireland, there is a mail steamboat service daily. The route via Stranraer affords the shortest sea passage to and from Ireland, and the steamers sail in direct connection with express trains between London and Stranraer and between Larne and Belfast, &c.

In conjunction with the Midland Railway, an excellent service of fast express trains is run between Glasgow (St. Enoch) and London (St. Pancras), giving connections between the south and west of Scotland and all parts of England. Locally the Glasgow and South Western Railway has always prided itself on the maintenance of a full and expeditious service of trains, particularly in respect of fast trains between Glasgow and the Ayrshire coast towns, for residential purposes, a policy which has developed a surprisingly large traffic in daily travel of business people, who find it not only possible but convenient to reside all the year round at their favourite coast resort, and make the daily journey thence to the City. In this connection, reference may be made to Mr. J. F. Gairns' article



TWO OF MR. WHITELEGG'S 4-6-4 TANK ENGINES IN ST. ENOCH STATION, GLASGOW.

One has brought in an express from Largs, the other the Ayr–Glasgow 50-minute express.

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in the January, 1922, number of the RAILWAY MAGAZINE.

The Glasgow and South Western Railway also owns a fleet of steamers plying on the Clyde coast, connecting with its trains at Greenock, Largs, Fairlie, Ardrossan, Troon and Ayr, by means of which its sphere of influence is widened to include such popular resorts as Dunoon, Rothesay, Arran, &c. Trains are also run in connection with MacBrayne's, Williamson's and other steamers to the Western Isles, Ardrishaig, Inverary, Campbeltown, Ireland, the Isle of Man, &c. The company owns the harbour or piers at Renfrew, Largs, Fairlie, Troon and Ayr, and is part owner of Girvan and Stranraer harbours. The Glasgow and South Western Railway hotels at St. Enoch (Glasgow), Ayr, Dumfries and Turnberry stations are well known and highly esteemed. Refreshment and dining rooms are provided at Glasgow, Greenock, Kilmarnock, Dumfries and Ayr.

This does not by any means complete the list of this company's enterprises, which are much too numerous to chronicle, but it may serve to give some indication of the extent of its activities, and of the important position which it undoubtedly occupies in the realm of the railway world. On the goods train side the Glasgow and South Western Railway has widespread activities, and in this connection readers may be referred to the series of articles published in the April, 1911, number of the RAILWAY MAGAZINE, and to an article included in the January, 1914, issue, besides other references from time to time. The foregoing will, however, indicate that the Glasgow and South Western Railway has taken a large share in the industrial and traffic development of the areas which it serves, that it has given a distinct lead in regard to fast residential facilities over considerable distances and to holiday traffic arrangements between Glasgow and Ayrshire coast towns, and in connection with the Clyde steamer services, and that it will constitute an important section of the new grouped system into which, with its neighbour the Caledonian, with which it has many interests in common, it is to be merged.

We are indebted to Mr. Cooper, General Manager, and Mr. Armstrong, Superintendent of the Line, Glasgow and South Western Railway and their assistants for material utilised in the compilation of this article.

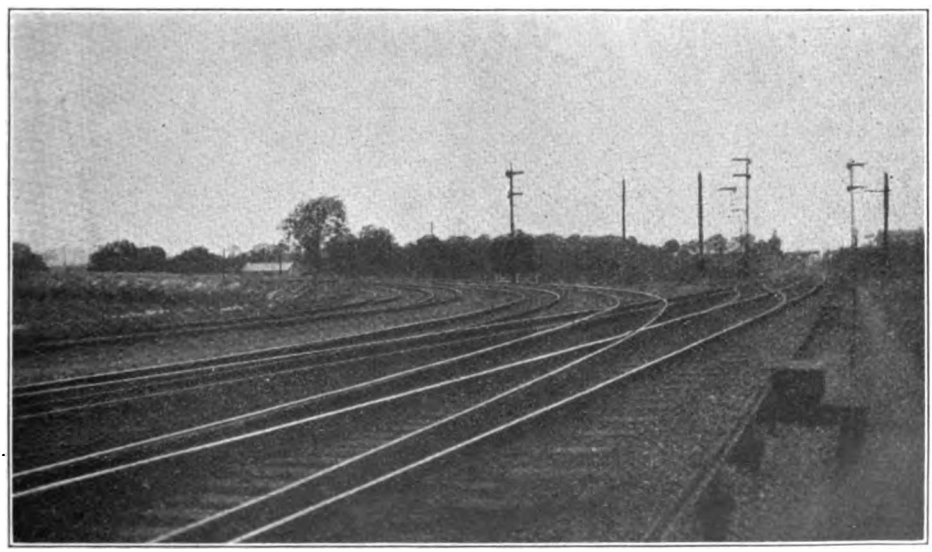

Photo.] [*H. M. Adamson.*

PORT CARLISLE BRANCH JUNCTION, NEAR CARLISLE.

"Waverley" Route, North British Railway, to left; Caledonian Railway, straight ahead.

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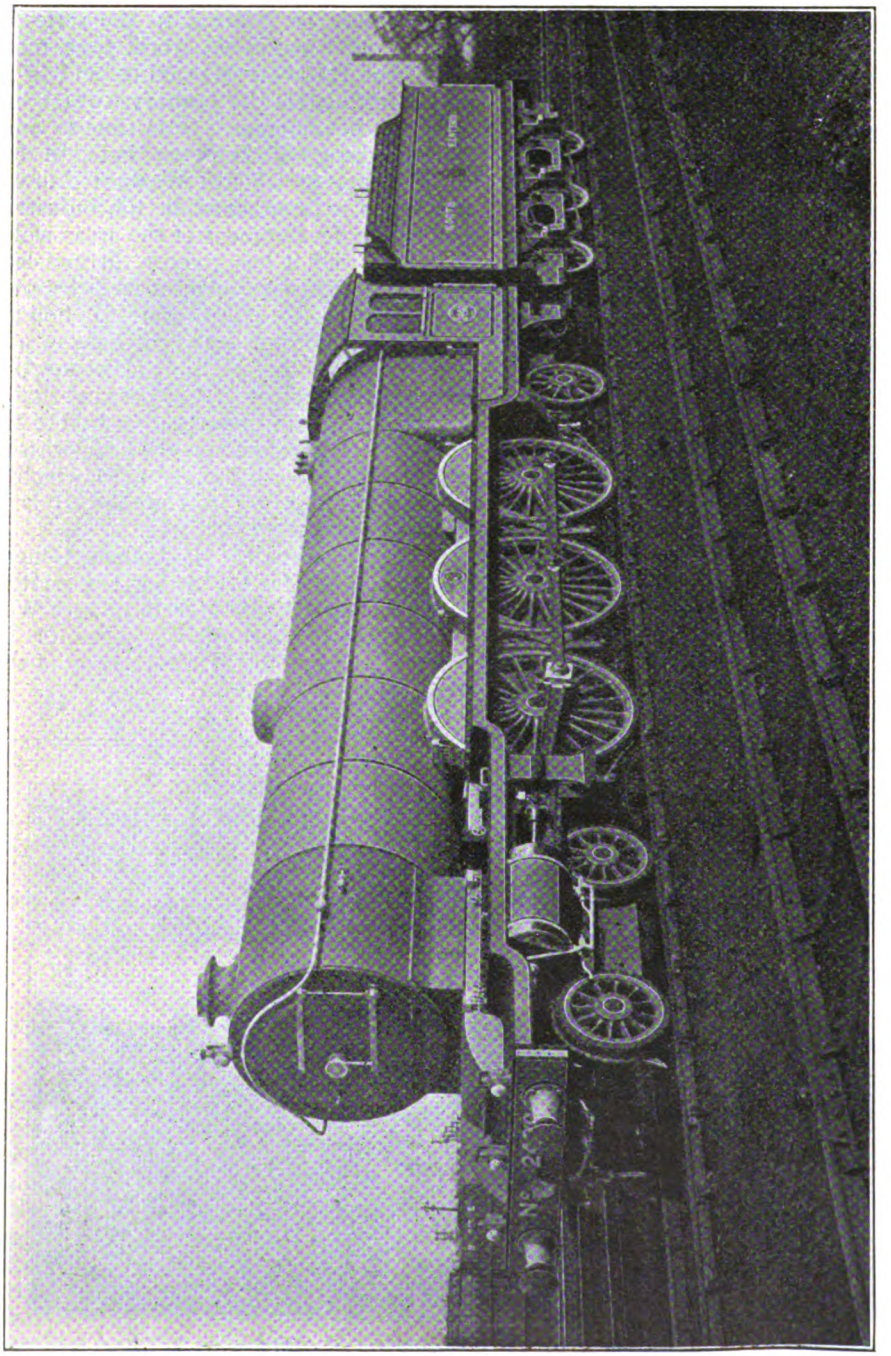

THREE-CYLINDER 4-6-2 EXPRESS LOCOMOTIVE, NORTH EASTERN RAILWAY.
Sir Vincent L. Raven, K.B.E., Chief Mechanical Engineer.

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Three-cylinder 4-6-2 Express Locomotive, North Eastern Railway.

PARTICULARS have already been given of the 3-cylinder "Pacific" express passenger locomotive under construction to the designs of Sir Vincent L. Raven, K.B.E., M. Inst. C.E., M.I.Mech.E., Chief Mechanical Engineer, North Eastern Railway. The first of these engines recently left the works at Darlington for trial trips, and we are enabled by the courtesy of Sir Vincent Raven to reproduce a photograph of it.

The cylinders are 19-in. diam. by 26-in. stroke. Cylinders and steam chests are in one casting, the steam chests being common to all, while the three exhaust chambers are separate to the bottom of the blast pipe, where they combine. The cylinders are fitted with piston valves, 8¾ in. in diameter and the valve gear—Stephenson's link motion—is applied direct to each of the cylinders. The driving wheels are 6 ft. 8 in. diam., and the rigid wheelbase 15 ft., the total wheelbase for the engine being 37 ft. 2 in.

The bogie wheels are 3 ft. 1¼ in. in diam., and arranged on a wheelbase of 6 ft. 6 in.; carrying wheels 3 ft. 9¼ in. in diam. are employed, these being fitted with radial axleboxes with a side movement of 3½ in. The boiler is fitted with a round-topped firebox casing, and upon it are mounted three safety valves of the "Ross" pattern, the working pressure being 200 lb. per square inch. The boiler tubes are 2¼ in. in diameter, and the smoke tubes 5¼ in. diam. There are 119 of the former and 24 of the latter with superheating elements. The firebox casing is 8 ft. long by 6 ft. 5 in. at the bottom, the actual grate area being 41·5 sq. ft. The firebox is extended into the barrel of the boiler, its overall length being 11 ft. 1¾ in. The effect of this extension has been to reduce the length of tubes and increase the firebox heating surface, whilst it further acts as an additional combustion chamber.

The tender is of the self-trimming type, carrying 5½ tons of coal and 4,125 gallons of water. It is six-wheeled, having a wheelbase of 12 ft. 8 in. The combined wheelbase of the engine and tender is 62 ft. 2¾ in., and its length over buffers overall 72 ft. 7¼ in. The weight available for adhesion is 60 tons, while the total of engine and tender in working order is 148 tons 2 cwt.

The engine develops a tractive effort at 85 per cent. boiler pressure of 29,918 lb. The engine is now working trains and giving every satisfaction.

The distribution of heating surface is as follows:—

	sq. ft.
119 ordinary tubes, 2¼ in. diam. outside	1,472
24 superheater tubes, 5¼ in. diam. outside	692·7
24 superheater elements	509·9
Firebox	200
Total	2,874·6
Grate area	41·5

With the completion of the first "Pacific" type locomotive to be introduced by the North Eastern Railway, the number of separate classes of tender engines having the 4-6-2 wheel arrangement in service on British railways has been increased to three. Sir Vincent Raven's new locomotive is interesting by comparison with those of the Great Western and Great Northern Railways in respect of certain details, and particularly for the reason that all three cylinders drive the leading pair of coupled wheels, whereas in the Great Western Railway four-cylinder engine, *The Great Bear*, and the Great Northern Railway No. 1470 three-cylinder class, different axles are driven by outside and inside cylinders. The North Eastern locomotive, again, has a separate link motion valve gear for each cylinder, the other two relying upon two sets of mechanism for actuating the valves of all the cylinders. One effect of driving on the leading coupled wheels is usually to increase the wheelbase of the engine, at the same time restricting the length of the connecting-rods, and, as it happens, of the three engines referred to, the North Eastern has the longest wheelbase, thus conforming to what is generally understood upon the point.

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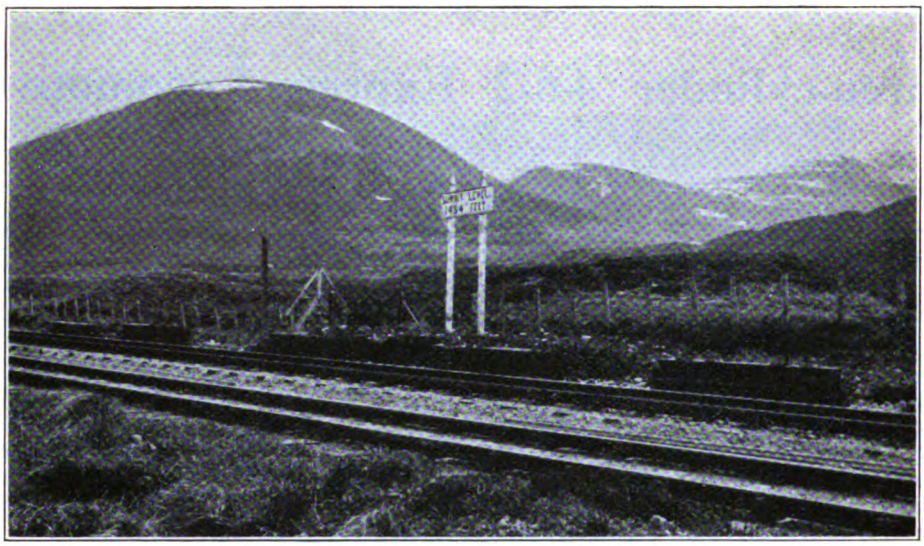

DRUIMUACHDAR SUMMIT, HIGHLAND RAILWAY.
The highest railway summit in Great Britain, 1,484 feet above sea level.

The Highland Railway:

ITS CONTRIBUTION TO THE ECONOMIC LIFE OF THE HIGHLANDS OF SCOTLAND.

THE changes foreshadowed under the Railways Act, 1921, are in process of becoming a *fait accompli*, and the Highland Railway, in common with many other lines, is to-day in the melting-pot of the National Grouping Scheme. On the eve of its "passing"—remembering John Bright's dictum that "the railway has rendered more service, and received less gratitude than any other institution in the country"—no apology need therefore accompany this tribute to the great services rendered by the Highland Railway to the Highlands of Scotland. One conceivable way of estimating the magnitude of this contribution would be to contrast the social and economic standing of the Highlands to-day with the conditions that prevailed in pre-railway times. The extraordinary transformation which this comparison will reveal—while properly considered as the outcome of many progressive influences—would still have been impossible but for the singular circumstance of railway introduction and development. In the present article, however, it is not intended to deal exhaustively with the subject, but rather to allude, in a very general way, to the broad lines and main features of development associated with railway enterprise in the Highlands of Scotland, the full story of which is charged with an interest and a thrill without parallel in railway history.

The background of this study recalls a period—the late 18th and early 19th centuries—when, be it remembered Lowland Scotland and England, as the result of great advance in mechanical science, were soaring rapidly to the "dizzy heights" of commercial and industrial prosperity. The Highlands of Scotland were then, by the irony of a cruel fate, debarred from enjoying a fair share in this advancing civilisation and were reaping the fruits of natural lethargy and enforced commercial inactivity. Thus, "with agriculture and fishing practically dormant, and handicrafts few and rude," there were no staple industries, no real sources of wealth, and consequently trade and

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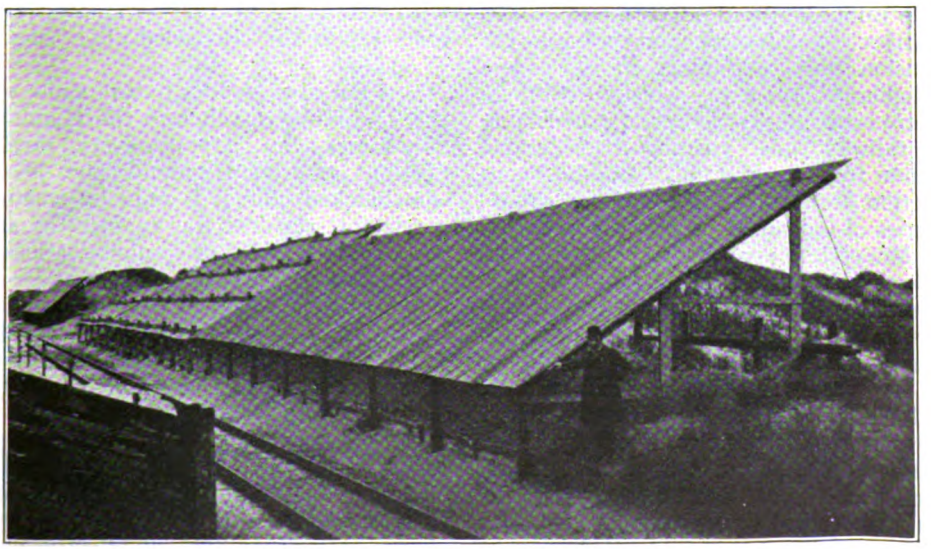
commerce were so meagre as to be altogether negligible. Stagnation was writ deep on the page of communal life in the Highlands; and with the outlook gloomy in the extreme, it is not to be wondered at that the only avenues of escape from destitution and death were fully utilised, and thousands emigrated to foreign shores, or tramped down the glens to the mining and industrial towns of the Lowlands.

The first serious effort to open up the Highlands did not come until the early part of the 19th century, when the road problem was grappled with. Previous to 1803, there were no good traffic roads in this area; for, although the Government had constructed roads much earlier, these were planned for military ends and were unsuitable for commercial purposes. But in that year the Government enlisted the services of the world-famous engineer—Thomas Telford—to construct new roads and bridges in the Highlands "with the object of promoting fisheries and preventing further emigration from these parts." Telford concentrated first on the main lines radiating from Inverness to the south, east and north; then turned his attention to improving the roads in the interior, so that by the year 1820—as history records—there were close upon 1,200 bridges and 920 miles of good traffic roads added to the road communication of this region. This was a big advance: soon these roads became the jolting tracks of numerous picturesque stage-coaches—the interesting precursors of the railway—penetrating as far south as Perth and Edinburgh, east to Aberdeen, north to Wick and west to Fort William, and thus was contact established with the beating centres of industry and commerce. Here it may be interesting to note that the route ultimately selected for the railway line from Inverness to Perth was that followed by the stage-coaches.

But it was the railway that was destined to transfuse into the community life of the Highlands something of the spirit and outlook of Southern Britain. Because of this it is deserving of fuller notice. The inspiration in this movement came, of course, from the south; the Highlanders were left to find the *sine qua non*—capital and constructive genius. An appeal for Government assistance failed, but Highland noblemen and landowners of the seven counties interested in the project came to the rescue and poured out their treasure, even to the extent of pledging their estates. Such deep-rooted patriotism and self-sacrifice is surely unexampled in our country's history. On the engineering side, where the difficulties to be contended with called for skill, courage and perseverance of the highest order, the Highlands again provided the man for the task; and to Joseph Mitchell—a



SAND AND SNOW BLOWER AS USED AT EXPOSED SITUATIONS ON THE HIGHLAND RAILWAY.

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distinguished son of Inverness—belongs the honour of having been the first engineer to demonstrate the possibility of working long gradients (reaching 1,484 ft. above sea-level) by mechanically-driven locomotives. He was the moving spirit in the crossing of the "Scottish Alps," where to-day the highest summit of any main line in Britain is to be found.

The year 1855—when the first railway line was laid between Inverness and Nairn—marks the beginning of a new era in Highland history. With the railway came the spirit of commercial and industrial enterprise; and, all along its line of advance, new settlers kept pouring into the Highlands bringing with them their full quota of commercial enlightenment, and a healthy rivalry and competition set in. No time was lost in applying new principles of agricultural science to the cultivation of land; vast wildernesses were reclaimed and converted into profitable fields yielding grain and root crops, and the marketing of cattle and sheep became a source of profit to farmers. The cutting down of vast forests of trees for supplying timber to the mining and shipbuilding centres of Scotland and England developed into a great lumbering industry, employing many hundreds of people; while around the coasts the fishing industry was now revived and developed with ever-increasing prosperity, and the "harvest of the seas" borne in haste to the Billingsgates of our own and foreign countries. Not less phenomenal was the extension that took place in the oldest of Highland industries—whisky-distilling: numerous distilleries were established along the railway line yielding considerable revenue from their traffic. Building construction drew its supplies from the stone-quarries of Caithness, Ross and Cromarty, and Morayshire; access to the southern markets regenerated the ancient woollen industries of Sutherlandshire and Inverness-shire; a new lease of life was imparted to the time-worn crafts of spinning and weaving—all with beneficial results, to which Highland homes alone can testify. There is, relatively, no real poverty in the Highlands of Scotland to-day. The dearth of mineral-wealth in these parts was soon overcome by procuring supplies from the coal and iron-fields of the south, and in this way flourishing shipbuilding and engineering works were early established in Inverness, which, as the natural outlet for traffic to and from the northern Highlands, was destined to become the largest and most progressive centre north of the Grampians. Similarly, though in lesser degree of importance, throughout the scattered districts served by the railway line, there arose from out their Cimmerian darkness and insignificance a host of busy little townships alive with the din and bustle of a new civilization. But thanks are due to the railway for other sources of wealth: it has introduced the landscape "hunter" to the natural charm of picturesque scenery in the "land of mountains, moors and lochs," and carried the sportsman to some of the richest sporting fields in all Britain. It has wafted to the south a breath of the wholesome atmosphere of remotest Britain, only to return heavy-laden with tourists and invalids seeking health and pleasure among its romantic "bens and glens."

These, then, are representative of the many directions in which the railway has brought wealth, contentedness, and prosperity to every home in the Highlands. The best criterion of the increasing ratio of this contribution will be found in the official reports of the Highland Railway Company relating to different periods of its history. A comparison of statistics shows that whereas in 1866-67 the revenue from all sources did not reach £200,000, by the year 1886-87 it had risen to nearly £380,000, while in 1921—the latest available report—it exceeded the sum of £1,000,000.

But not always does nature smile upon the lot of the traveller to the Highlands. Sometimes—but, happily, very rarely—portions of the Highland line become snowblocked, and it is only by waging a persistent, ruthless war against the snow fiend that the lines of communication can be kept open. At such times of crisis the snowplough is much in evidence, clearing the track, assisted—when and where necessary—by emergency squads of workmen wielding shovels. Those who have made a long railway journey at home or abroad under these Arctic conditions will not easily forget their experience. The thrill and excitement of it can be better imagined than described. But prevention being always better than cure, an effective check has now been imposed by the Highland Railway Company upon the recurrence of

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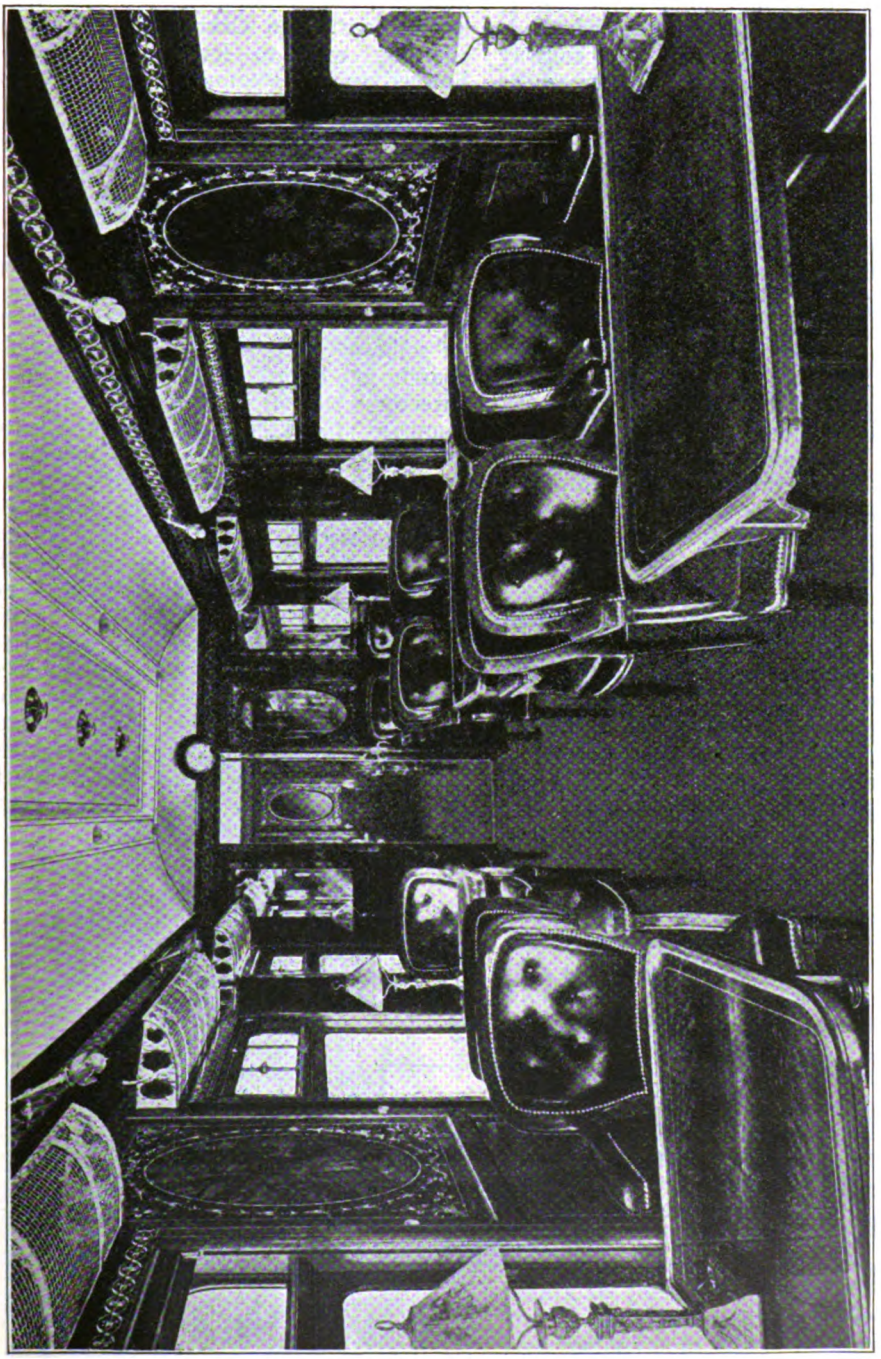

INTERIOR OF DINING SALOON, NEW FIRST AND THIRD CLASS PULLMAN DINING CAR, "LADY NAIRNE," CALEDONIAN RAILWAY.

This car, since it was placed in service, runs between Glasgow and Aviemore, Caledonian and Highland Railways.

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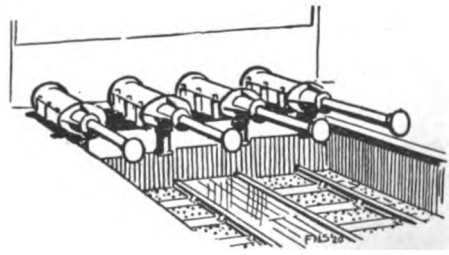
these extreme conditions by the use of what are appropriately termed "snow-blowers" and snow fences. The "snow-blower" is a simple wooden structure, resembling an inclined plane, which is firmly anchored alongside the railway track at various points where, owing to the contour of the surroundings and the nature and direction of the prevailing winds, there is always a tendency for drifts to form. The blizzard, caught up behind the plane of the "blower," is enforced in a straight draught across the track, thus blowing the drift clear of the rails and depositing it on the opposite bank, where its accumulation is harmless to traffic on the line. This simple, but very effective, device is much in vogue on the Highland system—more particularly on those sections which penetrate bleak and barren counties like Caithness and Sutherland, while the same device is also employed with satisfactory results in keeping the line clear where it is exposed to the severe sand storms of the Morayshire coast.

The inner history of the Highland Railway, as a substantial commercial concern, may interest readers of the RAILWAY MAGAZINE. Like most other railways, the "Highland" had its origin in modest measures, independently promoted by small companies, all financed by Highland "lairds and millionaires." The activities of these various companies were later—notably in 1865 and 1884—co-ordinated into one consolidated system now penetrating as far north as Wick and Thurso—linking up the steamer service with the Orkney and Shetland islands; west to Kyle of Lochalsh—linking up the steamer service with the outer isles; east as far as Keith; and south, over the Grampians, to Perth. Taking account of all subsidiary branches and sections, the system at present embraces close upon 500 miles of railway track, much of which remains a silent monument to extraordinary human effort and costliness, especially where sections of the line have had to be excavated out of solid precipitous rock. All along the march, no efforts have been spared by directors, officials, and employees of the company to extend facilities and effect such improvements as were calculated to place the service on the most up-to-date footing. The result is that, to-day, the accommodation, comfort and general conditions of travel on this line can well be compared to any provided by the larger companies in England or Scotland. What with sleeping and dining cars—the latter the most recent innovation in this respect—and the haulage capacity of the most highly improved locomotive engines, coupled to well-furnished passenger-coaches, travelling to and from the Highlands of Scotland has all the charm of a journey in fairyland.



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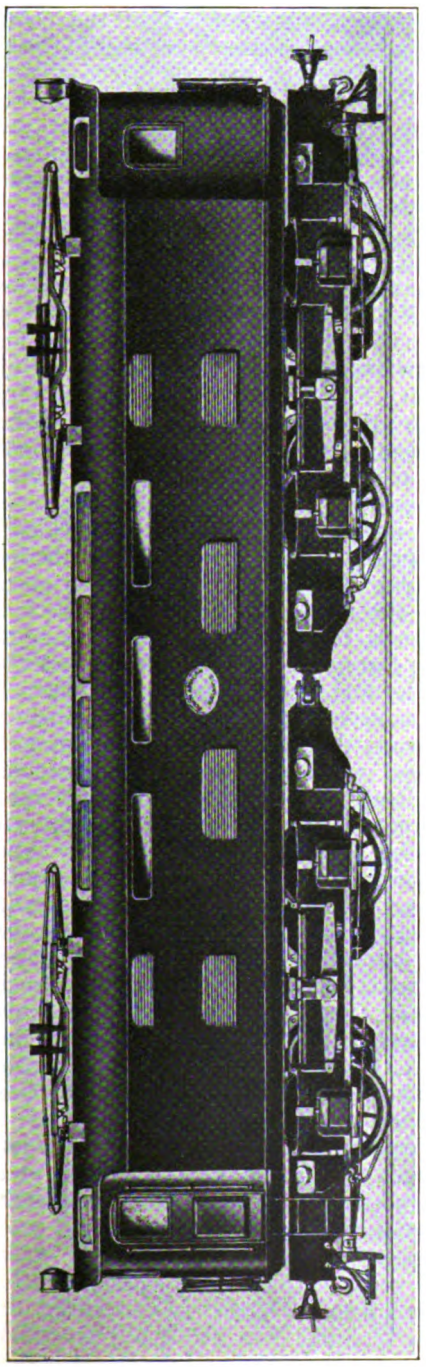
Metropolitan-Vickers Electric Locomotives for the South African Railways.



0-4-4-0 ELECTRIC LOCOMOTIVE FOR SOUTH AFRICAN RAILWAYS.

THE decision of the South African Railways and Harbours Administration to electrify the section of main line track between Glencoe and Pietermaritzburg, a distance of about 171 miles, has resulted in an important contract for electric locomotives being placed in this country. The locomotives, of which 78 have been ordered from the Metropolitan-Vickers Electrical Company, Limited, are designed to haul passenger and freight trains over the electrified area, and are so arranged that they can be worked alone or with other locomotives in multiple unit controlled by one driver.

Conditions to be fulfilled are as follow :

1. Three locomotives coupled together shall be capable of hauling a train weighing 1,800 short tons up a 1 per cent. grade at a speed of 21 to 22 miles per hour, and hauling the same train on level tangent track at 36 miles per hour.

2. The locomotives shall be capable of running at a speed of 45 miles per hour without injury to any part.

3. Three locomotives coupled together shall be capable of starting a train weighing 1,800 short tons on a rising gradient of 1 in 100 and attaining a speed of 22 miles per hour in 3 minutes.

4. Three locomotives coupled together shall be capable of holding a train of 1,640 short tons on a falling gradient of 1 in 50 by regenerative action alone.

The normal duty which the locomotives will be called upon to perform is the hauling of a train weighing 1,430 short tons from Ladysmith to Pietermaritzburg, a distance of about 129 miles, in a little more than 7 hours, and in the reverse direction a train weighing not less than 625 tons in about $7\frac{1}{2}$ hours, the work being done by three locomotives coupled together. They are to be capable of performing a round trip from Ladysmith to Pietermaritzburg and back under these conditions once every 24 hours for six days a week. Gradients on the line between these points are mostly in favour of the loaded trains, the ruling gradient against the load being 1 in 65 compensated. The ruling gradient for the trains returning from Pietermaritzburg to Ladysmith is 1 in 50 compensated. The maximum

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gradient on the section to be electrified is as much as 1 in 30 uncompensated, but these gradients occur on an old line which will principally be used as an alternative route in the event of the main line being blocked. Under these conditions the loads will be reduced to the capacity of the locomotives on this steeper gradient.

The design illustrated includes two four-wheeled bogies coupled together at their inner ends by means of a ball articulating joint to allow free movement between the trucks. Draw and buffing gear is mounted directly on the bogies, thus ensuring that no undue strains are thrown on the locomotive body. The main driving motors are carried on the bogies and are supported by suspension bearings on the axles and nose supports on the bogie framing, and transmit their torque to the driving wheels by means of single-reduction gearing.

Each bogie is equipped with two motors, thus the total weight of the locomotive is available for adhesion. Each motor is capable of developing 300 h.p. at the one hour rating, corresponding to a tractive effort of 5,800 lb. at 20·75 miles per hour; the tractive effort which the motor is capable of exerting continuously is 4,100 lb. at a speed of 22·5 m.p.h. Thus the locomotive is capable of exerting 1,200 h.p., corresponding to a tractive effort of 23,200 lb. at the one hour rating, and a tractive effort of 16,400 lb. continuously. The maximum tractive effort which the locomotives are capable of exerting is about 43,000 lb., as determined by the adhesion between the wheels and the track. The motors themselves are capable of slipping the wheels of the locomotive under any conditions of rail.

The body, which is of the box type, is carried on two cross girders which form the bogie pivots and support the longitudinal girders of the body underframe. Roomy driving cabs are situated at either end, and each driving point is fitted with a controller, driver's valves, and the usual gauges, whistles and sanding switches, so that the locomotive can be operated equally well in either direction. A gangway is provided on one side which allows of easy access between driving compartments.

The control system is electro-pneumatic; all the control apparatus, together with the auxiliary machines and the main resistances, are mounted in the central compartment. This compartment is locked in such a manner that the driver is unable to enter until all apparatus has been made "dead," thus ensuring that there is no danger of the driver coming in contact with any high-tension apparatus which is "alive."

Trains may be hauled by a single locomotive or by two or more coupled together, and arrangements have been made for simultaneous operation of the coupled locomotives by a single locomotive crew from the leading driving point. Electric current will be taken from an overhead trolley line supplying direct current at 3,000 volts, and collected by means of two pantograph current collectors.

A dual system of brakes is provided, an air pressure brake being used on the locomotive, and the vacuum brake for operating the train brakes, which are of the vacuum brake system. In view of the very heavy grades met with on the section of the line which is being electrified, the locomotives are arranged for regenerative control, that is, the motors, during the period when the trains are descending gradients, act as generators and return current to the line, at the same time holding the train at a steady speed without the use of the mechanical brakes. The brake system is so arranged that, whilst the locomotive is regenerating, the brakes on the train can be applied without applying the locomotive brakes; should, however, the brake application exceed a certain predetermined limit, then the regenerative action will be cut off and the locomotive brakes automatically applied.

Weight in working order is 65 tons; gauge, 3 ft. 6 in.; overall length, 13 ft.; overall width, 9 ft. 2½ in.; diameter of wheels, 4 ft.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d.*

North and South Western Junction Railway.

With reference to the reply given in the November number, J. H. I. mentions that the Hammersmith branch was opened for passenger and goods traffic on April 8, 1858. The passenger coaches worked between Hammersmith and Fenchurch Street via Camden Road and Bow Junction. On the opening of the North London city lines (from Dalston East and West Junction to Broad Street) in October, 1865 (not 1896 as mentioned), the Hammersmith service was operated from Acton (Churchfield Road) until 1880, when the present South Acton station was opened and the service worked from a bay platform there at the back of the down platform. The line is now worked by staff from South Acton Junction, one engine in steam only being allowed on the branch. The present service consists of one goods train each way daily, with an extra trip from South Acton to Parry's Wharf and back in the evenings. The line is unlikely to be opened again for passenger traffic. The North London Railway worked the North and South Western line on behalf of the three constituent companies from the outset. The goods traffic at the present time consists almost entirely of Midland trains from Brent to Feltham, Battersea, West Kensington, &c., and London and South Western trains from Feltham to Old Oak sidings (Willesden). North London trains to the Great Western line at Acton use the North and South Western Junction Railway between Old Oak and Acton Wells Junction. London and North Western steam trains are not run over the North and South Western Junction Railway, except for two trips daily between Willesden and Kew Bridge, one of which also performs the work on the Hammersmith branch.

[Further reply to A. J. C.]

Lines in the Longhedge District.

We are not quite clear which line you have in mind, but there are two high-level lines on viaduct crossing the London and South Western Railway main line close to Queen's Road, Battersea, station, one carrying the London, Brighton and South Coast Railway main line and the other the South London line, in addition to the South Eastern and Chatham main line. The two former also cross a London, Brighton and South Coast Railway line from Poupart's Junction to Stewart's Lane, thence diverging to give a connection to Battersea goods depot or to join the main line at Battersea Pier Junction, this being actually a goods traffic alternative to the route taken by passenger trains between Victoria and Clapham Junction; a connection from the West London Extension Railway to Stewart's Lane Junction giving access to the Great Western Railway South Lambeth goods depot and to the South Eastern and Chatham lines to Victoria; and a South Eastern and Chatham line from Clapham Junction, with exchange con-

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nection from the West London Extension line proceeding towards Wandsworth Road to join the South Eastern and Chatham Railway. The last-mentioned would be used by the through service between the London and North Western and South Eastern and Chatham Railways.

[Reply to T. H. DONOHUE.]

Plymouth and Liverpool Through Services, Great Western Railway.

We are informed by the Superintendent of the Lines' Department, Great Western Railway, that the train leaving Liverpool at 12 noon is regarded chiefly as a service to Bristol, but owing to considerations at Temple Meads affecting the station accommodation, &c., the train is despatched at 5.45 p.m. to Taunton, and the coaches are subsequently sent forward to Plymouth for balancing purposes to be available for the 10.25 a.m. from Plymouth on the following day. Standard coach working arrangements are :—

(1) Van third, compo and van third—7.10 a.m. from Plymouth ; 9.10 a.m. from Liverpool, with dining car from (4) below.

(2) Brake compo, dining car, van third—8.40 a.m. from Plymouth ; 10.35 a.m. from Liverpool.

(3) Brake compo, dining car, van third —10.25 a.m. from Plymouth ; 12 noon from Liverpool (to Taunton, see above.)

(4) Van third, compo, van third—1 p.m. from Plymouth, with dining car from (1) above ; 2.45 p.m. from Liverpool to Bristol, continuing next day at 10.50 a.m. from Bristol to Plymouth.

[Reply to " SILURIAN."]

Train Speeds, 1904-5 and 1914.

" Voyageur's " articles in the October number compared 1922 train services with 1914, as immediately preceding the war years, with which only is it reasonable to compare present arrangements. If you can consult volumes of the RAILWAY YEAR BOOK for 1904, 1905, &c., or the " Summer Train Service " articles of the RAILWAY MAGAZINE, you will find many instances where even better times and more notable runs have been made. To some extent, however, these were spasmodic, and belong to the era of development which eventually settled down to the standards of the immediate pre-war years. With regard to deceleration as between 1914 and 1905 you must remember that train loads considerably increased, and on the Great Central Railway in particular a number of important trains were given additional stops, at very fast averages on the start-to-stop stages, but still adding somewhat to over-all times.

[Reply to J. ORMSBY RYMER.]

Emergency Stops.

As a rule, if a driver feels that the brakes of his train have been partially applied, as by the operation of the passenger communication chain or other appliance, he takes steps to pull up, except that if he cannot ascertain what is wrong he may use his discretion as to whether he will run on to a station or a signal-box before stopping. Under some circumstances, it is conceivable that if he had already had trouble from brake leakage he would disregard the partial brake application and take steps to counteract it, but usually he is required to assume that a warning has been given. As regards the incident you mention, we cannot say why the train travelled as far as it did after the alarm chain had been pulled.

[Reply to A. PEACOCK.]

Speed of Great Eastern Railway Tank Locomotives.

The small 0-6-0 tank engines of this railway probably attain up to 45 m.p.h. or slightly over, in descending the gradient from Chingford to Higham's Park. They are, indeed, capable of higher speeds than this, and on non-stopping trains from Wood Street or Hoe Street have been known to reach speeds well in excess of 50 m.p.h. on the falling gradient from Hoe Street to Clapton Junction, part of which is at 1 in 80. The 0-4-4 tank engines of the " 1100 " class would be capable of higher maximum speeds, but less rapid acceleration. 2-4-2 tank engines on this railway could doubtless attain the mile-a-minute rate with light loads on a level track, if put to it.

[Reply to P. D. MORRIS.]

Train Numeration.

It is a usual practice on most lines to refer to trains by the numbers given them at the head of columns in the Working Time-tables or in Working Notices, hence,

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in the absence of more exact information, and further particulars of the trains concerned, the high figures mentioned by you and their apparently haphazard selection. Why not inquire locally as to working on the through services further mentioned by you? A friendly conversation with railwaymen in the district will often clear up an apparent difficulty, where we should have to institute inquiry through official channels.

[Reply to "SILURIAN."]

American and Canadian Railways.

A number of books, both technical and popular, have been written describing the outstanding features of most of these railways. (See Railway Bibliography in the 1922 edition of the *Railway Year Book* for particulars of those by British publishers). Most American and Canadian railway periodicals are of a technical character, but many of the American lines issue staff magazines containing much material of interest. The *Railroadman's Magazine* has been incorporated with *Popular Mechanics*. It was the only American popular railway magazine, other than staff magazines, but was largely of a story character.

[Reply to T. R. P.]

Locomotive "Cut-off."

In the cylinder of any ordinary steam engine, whether locomotive or otherwise, steam is admitted for a portion of the forward or backward stroke of the piston, and is then "cut off" by the action of the slide-valve or piston-valve; for the remainder of the stroke the expansive properties of the steam are brought into play, ere, on the return stroke, the expanded steam is passed out of the cylinder into the exhaust. The exact point during the stroke at which cut-off takes place is regulated by the driver through the medium of the reversing gear. The maximum possible "cut-off" is usually about 75 per cent.

[Reply to VINCENT L. EDWARDS.]

R.O.D. Locomotives, South Eastern and Chatham Railway.

As we have explained, a few R.O.D. 2-8-0 locomotives were temporarily used on this line. We cannot give particulars of these. We understand that they were not numbered in the South Eastern and Chatham Railway stock. The 770 class of main line engines were designed and built for the South Eastern and Chatham Railway, whereas what are known as R.O.D. or War Department locomotives were either built to the Government order or were locomotives obtained from various railways and other sources, and thus known while in Government service.

[Reply to W. A. YOUNG.]

Gradients, Weymouth and Dorchester Line, Great Western Railway.

See the RAILWAY MAGAZINE for August, 1904, for gradient profiles. From Dorchester there is a descent at 1 in 117 for nearly 1 mile, level or easy for about ¾ mile, and 1 in 72 up for about 1 mile. From the summit there is a long descent through Upwey nearly into Weymouth, first at 1 in 53 (½ mile), 1 in 51 for nearly 1¼ miles, and 1 in 75 for 1½ miles. Your remarks concerning the working of London and South Western 0-4-4 tank and "462" and "485" class tender locomotives on this section are noted.

[Reply to G. W. GREEN.]

Piloting.

Even on the Great Northern Railway it occasionally occurs, especially if an unusually heavy train has to be worked over a section where small engines are used, and now and then it can be observed even on the main line, as for instance, assisting a main line engine from King's Cross to Potter's Bar summit. There are also cases where engines are attached as pilots for working home or to avoid running light. The general policy of this line is, however, against piloting.

[Reply to W. M. SMITH and R. WELLS.]

Fastest London–Inverness Time.

You are correct in claiming the Inverness–King's Cross time of 13 hours 50 min. by the 8.10 a.m. up as faster by 5 min. than the best time shown in the summer service tables (by the 7.30 p.m. down), although the former is not a *through* service, as is the latter. The 8 hours 20 min. time from London to Edinburgh of the 7.30 p.m. *ex*-King's Cross was not included, as this train does not convey Edinburgh passengers from London.

[Reply to T. W. ROSEWELL.]

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Midland Railway Locomotives.

In reply to your query concerning the rebuilding of the old "60" class of 4–4–0 locomotives, and the valve gear fitted thereto, Mr. E. L. Ahrons writes as follows: "After the 1907 renumbering, the class "2" 4–4–0 engines 483–562 had piston valves, *as originally built*, but the remaining class "2" engines 328 to 482 had slide valves between the cylinders. Of the latter, 403 to 427 were completely rebuilt with superheaters and piston valves, and for some time past Nos. 428 to 482 have been in the course of similar rebuilding. Nos. 358 to 402 are also being rebuilt with superheaters, and, I believe, piston valves, though many of them, and also of 428–482, still remain in the old form with slide valves, pending rebuilding. The class "2" engines 328–357 retain the slide valves, and are not superheated. The superheater rebuilds are all practically new engines, and those rebuilds which originally had 6 ft. 6 in. wheels in their old form, viz., 378–402, 428–482, have had the coupled wheels increased to 7 ft. diameter, so that eventually all will form one homogeneous class. I do not know whether any of 328–357 (6 ft. 9 in.) are to be similarly rebuilt, but so far I have not seen any." Mr. Ahrons suggests that the engines you have noticed are probably of the 358–482 series, non-superheated, pending alterations, many of these still retaining slide valves. [Reply to G. T. HART.]

Charing Cross as a Continental Traffic Centre.

Mr. E. A. Gurney-Smith indicates his objections to Mr. Sansbury's suggestions in the following terms: "Charing Cross should not be used for Continental traffic but for all the outer suburban and residential traffic that can be dealt with there (apart from the purely City traffic), owing to its most central position and convenience and consequent saving of fatigue to tired business people who are thus saved an extra stage (by tube or 'bus) in their daily journeys. This is where Sir Aston Webb is so utterly wrong in his proposals for its removal. He shirks the more difficult task, but one more worthy of his skill, of a reconstruction of the station and bridge as things of beauty and ornament to the capital of the Empire. Why, with electric traction at any rate, should railway termini be regarded as necessarily ugly? Continental traffic should remain concentrated at Victoria, which is more suited for it and quite central enough, as few people go to Paris every day."

[Further reply to C. THOMPSON.]

Combination Brake Vans.

Although it is not usual in this country to provide goods accommodation on brake vans, there are occasions when certain important consignments travel under the direct oversight of the guard, and there are many cases where it is of advantage to be able to deal with "transhipment" consignments under his charge. There are, therefore, a limited number of brake vans adapted also for the conveyance of goods, and presumably the vehicles you saw were of this class.

[Reply to K. W. S. M.]

Furness Railway Gradients.

We are indebted to Mr. L. Speakman, General Manager of the Furness Railway, for a gradient profile of the line between Barrow and Millom, showing that from Barrow there is a gradual ascent including, however, four level sections and two descents at 1 in 200 as far as the summit beyond Park Sidings. Most of this is not steeper tham 1 in 200, and frequently easier, though shortly before the summit there is a section of 19 chains at 1 in 130. From the summit there is a continuous descent at 1 in 94, 101, 115, 153, or easier, for 2½ miles, and undulations thence to a summit beyond Kirkby, all, however, with easy gradients. Thence to Millom is again undulating, the severest gradient being 1 in 360. Speed restrictions are in force at Thwaite Flat Junction (10 m.p.h.); at Kirkby (25 m.p.h.); and Foxfield (15 m.p.h. down line, 20 m.p.h. up line). [Reply to "FURNESSIAN."]

Man-Hole Indications.

We are informed by the General Superintendent, Midland Railway, that the letters "M.H." at the entrance to tunnels and under bridges, indicate that man-holes are provided at such points for cables, drains, &c.

[Reply to "ASHPAN."]

Furness Railway Viaducts.

Kent Viaduct, 522 yards in length; Leven Viaduct, 502 yards; Duddon Viaduct, 92 yards. [Reply to "FURNESSIAN."]

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"Brake" or "Break" Vans.

Dictionary references indicate that the use of either form of the word can be substantiated as regards derivation as applying to the "braking" of railway trains, and in earlier years the form "break" was frequently used, a few instances, such as that you mention, still remaining. Modern usage, however, is almost entirely in favour of the word "brake," and it is mainly in pedantical circles that the alternative spelling is still retained.

[Reply to A. PEACOCK.]

Fastest Great Eastern Railway Run.

The 2.32 and 5.56 p.m. non-stop summer expresses from Lincoln to Spalding travelled by the straight line at Sleaford, avoiding Sleaford Station, the distance by which is 38¼ and not 40¼ miles; average speed is therefore less than 50 m.p.h., and these runs are not entitled to a higher place in the summer service tables, as you suggest, than the Great Eastern run given.

[Reply to J. MARSHALL.]

Mail Trains, Great Western Railway.

The 9.5 p.m. down West of England mail train calls at Reading, Didcot, Swindon, Chippenham, Bath, Bristol, Bridgwater, Taunton, Exeter, Newton Abbot, Plymouth, Saltash, Bodmin Road, Par, Truro, Hayle and Penzance (due 6.50 a.m.). Mail exchanges are made at a number of other stations *en route*. The up train leaves Penzance at 6 p.m., due in Paddington at 3.55 a.m.

[Reply to R. W. HANBIDGE.]

Irish Railways.

Your criticism that "Bradshaw" is unreliable in regard to Irish railways is altogether unreasonable. Local occurrences necessitate so many adjustments that the publishers of "Bradshaw" have no doubt considered it best to insert merely the standard services without any guarantee that they will apply. No other course is, in fact, practicable while conditions remain so unsettled.

[Reply to J. A. DAW.]

Track Arrangement, London and South Western Railway.

The arrangement shown on page 302 of the May, 1922, RAILWAY MAGAZINE applies only for a short distance. Further along there are seven running lines, as you mention, but beyond Queens Road, Battersea, there are eight:—Down Main Local, Down Main Through, Up Main Through, Up Main Local, Down Windsor Local, Down Windsor Through, Up Windsor Through, and Up Windsor Local.

[Reply to F. G.]

Great Western Railway Rolling-stock at Liverpool.

Mr. K. C. Marrian writes that during the summer months a Great Western Railway corridor train was attached on Fridays, for excursionists for South Wales via the Great Central route, to the 6.20 p.m. from Liverpool (Central), going forward on the 7.30 p.m. special excursion train from Manchester (Central). On several occasions a coach in the new colours was used.

[Further reply to F. HEWITT.]

Meon Valley Line, London and South Western Railway.

This line, opened in 1903, was described in the RAILWAY MAGAZINE for June, 1903. The ruling gradient is 1 in 100. It was, of course, constructed long after the main line and was designed mainly to open up the district traversed. It is, of course, an alternative to the main line, though it is not usually so employed. A tunnel was proposed between Lymington and Freshwater, Isle of Wight, but we have heard nothing of it for many years.

[Reply to A. G. S. CHITTENDEN.]

The Longest Non-stop Run.

Premier place in the world, by a long margin, both in length and duration of time, is taken by the Great Western *Riviera* express from Paddington at 10.30 a.m., which covers the 225¾ miles from London to Plymouth (North Road) without intermediate stop in 4 hours 7 min. For running speeds see Mr. Cecil J. Allen's article in December, 1921.

[Reply to GEO. R. FORBES.]

4-4-0 Locomotives, South Eastern and Chatham Railway.

German-built 4-4-0 engines on this railway are numbered 770–781. These and the exactly corresponding engines built by Beyer, Peacock & Co. Limited, 760–769

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inclusive, resemble the "D1" and "E1" class rebuilt superheaters, except for having, as you state, straight running-plates, and rather larger boilers. The class in question was designed by Mr. Wainwright.

[Reply to "S.E. ENTHUSIAST."]

Roade Cutting.

We have no data suggesting that Roade Cutting is "the deepest in the British Isles," but we should hardly imagine it to be exceptional in this respect. A colour plate of London and North Western Railway 4-6-0 locomotive No. 66, *Experiment*, was given with the February, 1906, number. The Severn Tunnel has been frequently referred to, notably in the February and March, 1906, numbers.

[Reply to "PRECURSOR."]

Departmental Locomotives, London and North Western Railway.

Most of the engineering department locomotives are engines withdrawn from the ordinary stock, mainly of the "Precedent" and "Sampson" classes. For particulars, see Mr. C. Williams' Register of London and North Western Railway Locomotives, of which particulars appear in our advertising pages.

[Reply to T. A. LANGLEY.]

Indicator Shelters.

As illustrated on page 344 of the November RAILWAY MAGAZINE, Great Northern Railway locomotive No. 1471 has a shelter fitted to accommodate men taking indicator diagrams and other test records. These shelters are transferred to any engine on which tests are to be made.

[Reply to F. H. V. P.]

Crank Positions.

The question you raise has already been generally considered. To argue it in detail would require more space than we can permit, and would involve close study of the widely varying conditions under which locomotive engines frequently require to operate.

[Reply to J. C. L. PARSONS.]

Hotwells Branch.

A branch of the joint Great Western and Midland line from Bristol to Clifton and Avonmouth ran from Sea Mills to Hotwells, almost under the Clifton Suspension Bridge; this was never extensively patronised, and has not been used since its closing in the early days of the war.

[Reply to P. H. S. D.]

Bristol, St. Philips.

This terminus is used by Midland main line trains from points as far distant as Bath and even Bournemouth; but the North main line services are run exclusively into Temple Meads, owing to the importance of the through connections.

[Reply to P. H. S. D.]

"736" Class Locomotives, London and South Western Railway.

Your query is contrary to rules. The information desired can, however, be found on referring to the diagram on page 196 of the September, 1917, number, or the article on page 234 of the November, 1918, number.

[Reply to G. W. GREEN.]

South Eastern and Chatham Railway Locomotives.

Please see rules as to giving particulars of numbers of engines of particular classes. As you will see from the RAILWAY YEAR BOOK, the South Eastern and Chatham Railway has 203 tender 0-6-0 locomotives.

[Reply to L. G. PEGRUM.]

Beardmore-built 4-6-0 Engines, London and North Western Railway.

The order for these 90 engines was placed by the London and North Western Railway management with Messrs. Beardmore, and the Government was not concerned in any way.

[Reply to T. A. LANGLEY.]

York and the Great Eastern Railway.

Mr. F. H. Pinkham points out that Great Eastern through trains to and from York have been worked by North Eastern Railway locomotives, usually of the "R1" class, since October 17, 1921.

[Reply to S. WALLACE.]

London and North Western Railway Electrification.

As mentioned in the November number, the Coxley Green branch has been electrified. We are not aware that it is at present contemplated to equip the St. Albans, Rickmansworth and Stanmore branches.

[Reply to R. KIRBY.]

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Royal Trains.

As a rule, when the King and Queen travel from Portsmouth, the London, Brighton and South Coast Railway route is used, that company's royal train being employed.

[Reply to T. H. DONOHUE.]

London, Brighton and South Coast Railway Electrification.

Work is in hand on the electrification of the Cheam and Coulsdon lines, but no intimation has yet been made as to when electric working will be extended to cover these sections.

[Reply to R. KIRBY.]

Cuffley-Stevenage Line, Great Northern Railway.

As this line has not yet been opened for traffic, we cannot give the particulars you ask for completely. Please see, however, Mr. Hopwood's article in the July, 1920, RAILWAY MAGAZINE.

[Reply to M. H. BINSTEAD.]

Central Wales Line, London and North Western Railway.

An article describing this section was published in the May and June, 1906, numbers of THE RAILWAY MAGAZINE. We cannot add further to the information contained in that article.

[Reply to "DRAWBAR."]

Speedometers on Locomotives.

No British railway fits speed recorders regularly to its locomotives, though on many Continental lines they are compulsory. In this country, however, they are only fitted as required to engines under trial.

[Reply to F. L. H. F.]

Maidstone West Station.

This is not a terminus, but is treated as such for train service purposes. Trains can, however, be continued from one service to another and this occurs in practice to some extent.

[Reply to T. W. LINSELL.]

District Railway Steam Locomotives.

Two of the old 4-4-0 steam locomotives are still in service, but only for departmental use about the works and running construction and ballast trains. They still retain the old dark olive green colour.

[Reply to S. LEMEL.]

North London Railway Trains.

In early years, North London trains travelled as far as Windsor and to Hatfield but for a very long period they have not worked further than Potters Bar, Great Northern Railway.

[Reply to H. S. HACK.]

Isle of Wight Railway.

We are informed by Mr. H. K. Day, Secretary and General Manager, that the tunnel between Wroxall and Ventnor stations is three-quarters of a mile in length. We are also advised that no bogie vehicles are in use on this line; also that the whole of the passenger rolling-stock is lit by electricity.

[Reply to "BONCHURCH.]

Shunting Methods.

The method described by you is often adopted when the gradient is suitable and the arrangement of lines is not convenient for other means.

[Reply to A. G. BROWN.]

Head Codes, London and South Western Railway.

Information as to the various head codes in use can only be found in publications of a staff character.

[Reply to F. H. V. P.]

North Main Line, Great Western Railway.

4-6-0 locomotives are now permitted to work over the whole of the North main line throughout to Birkenhead.

[Reply to P. W. J. T.]

Caledonian Railway Distances.

We cannot undertake to supply particulars of distances between signal boxes in the detail you ask for.

(Reply to HAROLD BARGER.)

Midland Railway (L. T. and S. Section).

There are no tunnels on the lines which used to belong to the London, Tilbury and Southend Railway.

[Reply to T. W. LINSELL.]

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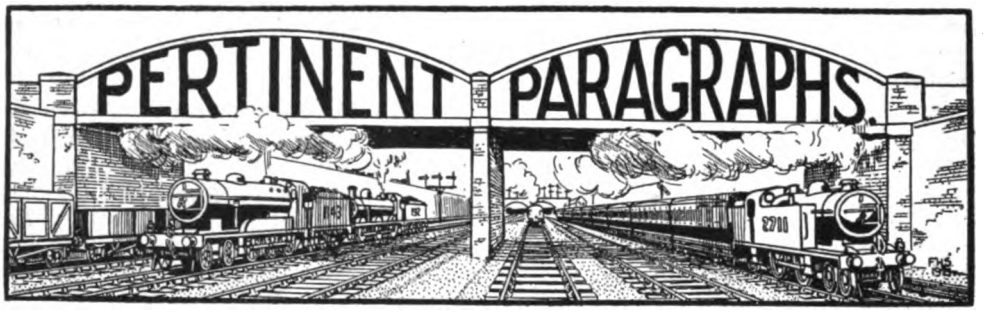

Special "Grouping" Railway Meetings.

DURING the last days of November "special" meetings were held of the proprietors and debenture stockholders of the constituent companies in the Eastern and Southern Groups, to approve the respective amalgamation schemes applicable to each group. In every case, except the South Eastern and Chatham Companies. these special meetings were followed by "extraordinary" meetings of proprietors to elect directors from each company to the new amalgamated company and to sanction compensation to the directors who are retiring in consequence of the amalgamations. Each of the two amalgamation schemes received the cordial approval of the proprietors and debenture stockholders of the companies concerned. They have yet to be passed by the Amalgamation Tribunal before becoming effective, but in view of the unanimity with which the schemes have been received by those chiefly interested, and in view of the fact that they are framed entirely in accordance with the spirit of the Railways Act, it is hardly likely that any very material alterations will be made by the Tribunal. The basis adopted for adjustment of terms was to take the free net revenue of 1913, which was the year referred to in Section 58 of the Act, for fixing the standard revenue of the new companies, with certain allowances for unfructified capital and for capital expended since 1913.

At the "extraordinary" meetings there was also complete unanimity in the selection of directors for the two new amalgamated companies, and in the case of the Eastern Group appreciative references were made to the new Chairman and Chief General Manager. The compensation to directors retiring in consequence of amalgamation was suggested by the different boards to be on a uniform basis of four years' purchase of fees, and the amounts adjusted on this basis were agreed to by the proprietors of all the companies who had the matter brought before them. It was explained that whilst the Railways Act enables the shareholders to vote compensation to their directors for loss of office, it compelled them to give compensation on a considerably more liberal scale to dispossessed employees.

The North Western, Midland and West Scottish Group.

MEETINGS of the "Constituent" companies of the North Western, Midland and West Scottish Group, except the Caledonian and North Staffordshire, have also been held and the amalgamation terms considered, as also the absorption of several subsidiary companies. THE North Staffordshire Company has, we understand, since agreed upon terms for the amalgamation of its undertaking with the "London, Midland and Scottish" Group. The latter came before the Amalgamation Tribunal for approval of a preliminary amalgamation scheme on Tuesday, December 19. The North Staffordshire adhesion is not, of course, included in that scheme, since the terms of the agreement had not been laid before and approved by the respective proprietors, but this will be done at an early date. A further scheme will then, if approved, be submitted to the Minister of Transport for reference to the Amalgamation Tribunal. The date by which agreed amalgamation schemes were to be submitted to the Minister—January 1, 1923—having passed, as this is a further preliminary amalgamation, it is proposed to proceed under the provisions of Section 8 of the Railways Act, 1921, whereby agreed preliminary amalgamation of absorption schemes may be submitted for reference to and confirmation by the Tribunal, "at any time after the passing of this Act." This procedure will also enable further absorption schemes, including that of the Caledonian Company, to be agreed upon between the parties and brought forward for confirmation during the first half of 1923. The Southern and London & North Eastern schemes were approved by the Tribunal on December 11 and 12 respectively.

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The New Companies.

AT the special railway meetings above referred to the names of two of the four new companies were officially intimated. That of the London & North Eastern Railway Company, which has been chosen by the railways comprising the North Eastern, Eastern and East Scottish Group, was mentioned last month, while the new title of the company which comprises the Southern Group of railways, also stated, is now known to be the Southern Railway Company—a terse and completely descriptive name. Of the other two groups, the Western Group will continue to be known as the Great Western Railway Company—this name having been provided for in the Act, wherein it is laid down that "the amalgamation scheme [with respect to the Western Group] shall provide for constituting the Great Western Railway Company the amalgamated company." With regard to the North Western, Midland and West Scottish Group, the name finally decided upon for the new company is the London, Midland & Scottish Railway Company. Thus, from the "appointed day," the main railway companies of Great Britain will be four, one the Great Western, bearing a name that already stands high among British railways, while the other three, the London, Midland & Scottish, the London & North Eastern and the Southern, start life anew, with the fruitful experience of the past and the opportunity of the present to assist them to make their names as well known as those of the constituent companies, now—unhappily, for some reasons—condemned to early extinction.

New Railway Bills.

ELEVEN Railway Bills or Provisional Orders are being promoted by railway companies. Affecting London, principal interest attaches to the proposals of the City and South London, London Electric, and Wimbledon and Sutton Railways. The City and South London Railway is to be extended from Clapham Common to a junction at Merton with the Wimbledon and Sutton line already authorised, and which is now to be put in hand. The "Hampstead" section of the London Electric Railway is to be extended to Waterloo, thus giving the London and South Western terminus a third tube connection, and connections are to be made with the City and South London Railway at Kennington. It will thus become possible, in conjunction with the new connections at Camden Town already in hand, and when the Hendon and Edgware line is completed, to run trains through either via Charing Cross or via the old City and South London line from Edgware and Hendon to Wimbledon and Sutton. Important improvements and extensions are proposed at Piccadilly Circus and Leicester Square stations. The Bill promoted by the Wimbledon and Sutton Railway Company includes a proposal to exempt the company from any obligation to provide either first or second-class carriages.

The Metropolitan Railway Company's Bill deals principally with matters arising from the construction of the Rickmansworth and Watford branch, which is now being put in hand. Other railways which are promoting Bills or applying for Provisional Orders are as follows:—Caledonian, principally in reference to the golf course at Gleneagles and an hotel to be built there; Great Western, for the construction of a new line at Colwall, near Malvern, and in regard to agreements affecting certain South Wales docks and harbours; also, in a separate Bill, for the transfer of the undertaking of the Swansea Harbour Trustees to the Great Western Railway Company. The London and South Western Railway proposes new works, including a floating dry dock at Southampton, widenings near Shawford, and alterations at Totton, Esher and Sidmouth Junction and Crediton stations; also the abandonment and discontinuance of the Basingstoke and Alton Light Railway and the railway from Fratton to Southsea, or portions thereof; and the transfer to the company of the Lynton and Barnstaple Railway, and to the London and South Western and Midland Railway Companies of the undertaking of the Somerset and Dorset Railway Company; other matters covered are the authorisation of crossing Nine Elms Lane by rolling-stock propelled by mechanical power, agreements with the Southampton Harbour Board for the working of railways and tramways at Southampton, and numerous other and incidental provisions. The Midland Railway Bill provides for widening of the Derby and Leeds Railway in the Wakefield district, and of the Birmingham and Gloucester Railway at Birmingham and at Bromsgrove. The North Eastern Railway Bill covers six short railways in Selby, Howden, Hull and Stockton-on-Tees; also certain bridge-widenings, and in regard to jetties in the River Humber. The Felixstowe Dock and Railway Company is also promoting a Bill. Several of the Bills include provisions in regard to housing and land questions, while additional capital and borrowing powers are applied for in seven instances.

The Glasgow Cable Subway.

IN many respects one of the most unorthodox railways in Great Britain, and yet, outside Glasgow, relatively little known, the

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affairs of the Glasgow Subway Railway Company are of vital concern to the industrial capital of Scotland in that, despite its alleged out-of-dateness, it carried in 1921 nearly 11½ millions of passengers, and its temporary closing from March to June last caused great inconvenience. Opened in 1897, it ranks next to the original portion of the City and South London Railway for age as a "tube" railway, but has always been operated as a cable line. Its length is about 6½ miles, a complete circuit, serving 15 stations and twice passing under the Clyde; its great value is that it connects the busiest districts of Central Glasgow on both sides of the river.

Booking Office Announcements.

In the booking halls of large stations the usual practice is to allocate the various booking windows for the issue of tickets, first-class, third-class, excursion, &c., with further classification according to the section of the line concerned or the specific destination for which tickets are issued. At times, however, two or three ticket windows only are required for all traffic, in which case, unless the boards or placards over or alongside each ticket window are changed, passengers may be somewhat inconvenienced by the fact that it is not clear to them at which window they will receive attention.

Photo.] ST. ENOCH STATION, GLASGOW CABLE SUBWAY. [*J. F. Gairns.*

The trains are made up of two or more cars, of which 50 are in service, and a frequent service is given throughout the day, at very close headway, on both "Inner" and "Outer" Circles during the busy hours. A uniform fare is charged for any station, passengers passing through turnstiles at the booking offices. The busiest year was 1920, when nearly 21 million passengers travelled, though even in 1898 they numbered nearly 10 millions, and many years have exceeded 16 millions principally, if we remember rightly, when the standard fare was 1d. instead of 2d. It was found necessary to close down last March until the beginning of July, and the resulting inconvenience has led to an arrangement being concluded with the Glasgow Corporation for the purchase of the line for £385,000, while its modernisation as an electric line is a probability of the future.

Frequently, too, tickets of a special character are issued from an ordinary window. In such cases there is much to be said for the practice adopted at Glasgow (Central) station, Caledonian Railway, where, alongside each ticket window, racks are provided in which supplementary boards can be placed as required, thus amplifying the indications as to the issue of tickets at the particular window concerned. Another good feature noted at this station is that of placing cards over windows which are very busy, indicating that third-class or other tickets can also be obtained at, say, No. 3 window. This is a material aid in reducing congestion at any one window and is much appreciated by passengers who may thus be saved the annoyance of waiting in a more or less lengthy queue for attention, whereas tickets could be obtained without delay elsewhere, had they been informed.

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Train Service by Referendum.

UNDER this title the *Railway Gazette* recently referred to an invitation by the Caledonian Railway asking regular travellers to state the preferred time of departure for the last local train from Dundee. Our attention has also been directed to the fact that on the South Eastern and Chatham Railway it has for many years been the practice, when considering alterations in the trunk trains, to invite the co-operation of the civic authorities of the principal towns which the railway serves. This system of taking into confidence their travellers has been extended on many occasions in other directions, as for instance, when considering the alteration of particular suburban trains a plebiscite has been taken of the passengers as to whether they preferred an earlier or a later timing. A still more interesting development of this method of conducting business occurred last summer. This particular railway has for many years done a great deal in the way of providing practically all-night services for London workers, such as pressmen, postal workers and market employees, and the provision of the right number of trains at the particular hour at which they are required has been a matter of considerable difficulty, one section of the workers invariably requiring a somewhat different time from the others. Frequent correspondence on this subject culminated in a meeting which was held in the office of the Superintendent of the Line in August last, at which representatives from each of the London markets, circulation offices, and postal workers of all descriptions, were brought face to face, the situation fully explained to them all by the Superintendent of the Line, and they were then asked collectively to select their own times. Naturally all could not be accommodated with precisely the train times which they required but a remarkable degree of unanimity was secured.

Tablet Exchanging Platforms.

ALTHOUGH there are, as a rule, recognised positions, either adjacent to the signal box or along a station platform, where electric train tablets can be exchanged as a non-stopping train is passing at reduced speed at a crossing station on a single line section (where tablet exchanging apparatus is not installed), there is much to be said for the practice on the North British Railway of providing small enclosed stands especially for this purpose. On nearly all sections of this railway where traffic is controlled by electric train tablet, these stands, consisting of a raised platform with an enclosing rail, can be noted. There is thus no uncertainty as to the position at which the fireman of a non-stopping train will find the signalman waiting to hand to him a new tablet and to receive that for the section just traversed. There is also the further advantage that the signalman knows that he occupies the position most convenient for exchanging tablets and that the enginemen will be ready for him, while he is assured that he is standing near enough to the train to perform his work with convenience to both parties and, at the same time, is sufficiently clear to avoid the risk of being struck by any part of the train. Where trains run through crossing stations on single lines frequently without stopping, it is, of course, preferable to provide exchanging apparatus, especially as this avoids reduction of speed. Otherwise, the best system is that of arms over which the fireman passes the loop of the tablet satchel he is giving up and from which he takes the satchel containing the new tablet, as used so largely on the Great Western Railway. But where special provision of either class is not made the stands provided on the North British Railway appear to offer many advantages.

Pullman Cars in Scotland.

SINCE their first introduction, Pullman cars have abundantly justified their inclusion in the make-up of Caledonian Railway trains. It is true that to some extent, as between Carlisle, Carstairs or Symington and Perth, and between Glasgow and Perth and Aberdeen, they replace the restaurant cars previously provided, and are available for both first and third-class passengers without supplement. To that extent, therefore, their *clientéle* is virtually that of a main line restaurant car, although the accommodation is more palatial in character. The conditions are not, however, directly comparable to those which apply when Pullman cars are operated as supplementary to the ordinary accommodation. Between Edinburgh and Glasgow a number of Caledonian trains include first-class Pullman cars for which supplements are charged, while on the Oban line a Pullman observation car is operated during the summer months, and this has proved very popular indeed. Commencing June 1, 1922, the Pullman Car Company operated, by arrangement with the Caledonian and Highland Railways, a Pullman dining car running between Glasgow and Aviemore. This proved so popular that a second car had to be added from August 21, 1922, during the pressure of the tourist season, and this continued to run until October 14. We are indebted to Mr. C. M. Trott, the Pullman Car Company's representative in Scotland (his headquarters being at the Central Station, Glasgow, Caledonian Railway), for the following particulars of numbers of passengers conveyed and meals served in Pullman cars during June, July and August of last summer. In June, 12 cars carried 14,912 passengers and served 13,995 meals. In July, 12 cars carried 16,814

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passengers and served 15,740 meals. During August, 13 cars were running, carrying 18,090 passengers and serving 17,101 meals, and in September they conveyed 18,697 passengers and served 17,640 meals. In connection with the cars running on the Highland Railway, we are informed that during June, 1,643 meals were served, and 2,622 in July, and 2,868 in August, and 3,821 in September.

Restaurant Car Facilities on the Great North of Scotland Railway.

SINCE last July the Great North of Scotland Railway has included, in one of the sets of vehicles used for working its share in the Great North and Highland through services between Aberdeen and Inverness, a restaurant car, thus adding a much appreciated facility to this important service. The car is run on the 8.5 a.m. train from Aberdeen after the arrival of through night trains from the south, and is due at Elgin, via Craigellachie, at 10.35 a.m. and Inverness at 11.55 a.m. It returns on the 12.50 p.m. from Inverness, leaving Elgin at 2.25 p.m. and reaching Aberdeen, via Buckie, at 5.14 p.m., connecting with the 5.30 and 5.45 p.m. trains for the south. The car is available for both first and third-class passengers. The charges for breakfast and luncheon are 3s. and tea 1s. Seats are provided for 24 passengers, and the car is usually fully utilised in both directions.

Ayr Race Traffic.

IN common with most of the large companies, one of the periodic special traffics with which the Glasgow and South Western Railway has to deal is that associated with race meetings. Of those held in Scotland, the principal fixtures take place at Ayr, the July and September meetings especially attracting large numbers, not only from Glasgow and the immediate district but also from England. This calls for numerous special and relief trains to be run, and for many special arrangements, not only on the passenger train side during the actual meeting, but during days before and after. Thus, special horsebox trains require to be run for bringing horses and staff accompanying them, and for returning them after the Meeting. Special staff, rearrangement of engine and train men's duties, and provision of rolling-stock and storage after arrival, all have to be scheduled in connection with the additional trains run. Inspectors are appointed to control the movements of trains, and usually the Superintendent of the Line or an Assistant is on the spot to deal with any problems which may arise. During the busy periods all trains are required to come to a stand at certain signals approaching Ayr station, proceeding thence as instructed. Direction boards to be carried on the engines and labels on the carriage windows are a necessary adjunct.

Rolling-stock is stabled at various places in the vicinity, every detail, including instructions to enginemen where to pick up their trains, and for the disposal of their engines after arrival, and as to their movements before rejoining their trains, have to be worked out, with due regard to hours of duty and the home stations. In the case of through trains from other lines, Westinghouse-fitted engines may have to be provided. Light engine movements have also to be taken into account in connection with train movements, while special instructions are usually given as to taking water elsewhere to avoid occupying valuable time and blocking other trains at Ayr station. Ticket collecting and checking arrangements are also modified to ease the work at Ayr and at adjacent stations, while the platforms at Ayr are more closely controlled than usual. Goods and other traffic in the vicinity is subject to certain restrictions, while if the hours at factories, &c., in the district are altered or work suspended altogether, as sometimes happens on the principal day of the Meeting, workmen's and local trains may have to be altered or suspended.

On the occasion of the last September Meeting the number of trains arriving at Ayr in the morning and forenoon was 37 on Wednesday, 40 on Thursday, and 44 on Friday, while 33, 39 and 40 trains respectively were necessary for the conveyance of passengers returning after the races. On the last day no less than 16 *special* trains were run from Glasgow and Paisley between 9.15 a.m. and 12.10 p.m. On the Thursday a special North British excursion train from Edinburgh was run and on Wednesday a Midland excursion train from Leeds, &c., was provided, returning on Friday. A number of trains were altered and some extended, while many ordinary trains had to be strengthened.

Railway and Road Traffic on Connel Ferry Bridge, Caledonian Railway.

THE Connel Ferry bridge, claimed to be the Forth Bridge's " biggest British rival," is situated on the Ballachulish Extension of the Callander and Oban Railway, worked by the Caledonian Company. It was opened for traffic on August 21, 1903. The bridge, which is of cantilever type (hence the analogy suggested with the Forth Bridge), has a length of 524 ft. between the two piers, the clear span being 500 ft., and the headway above high-water level, 50 ft. Extreme height from high water to the topmost point of the bridge is 125 ft., while the middle span, carried by the two cantilever spans, has a length of 232 ft. This bridge not only

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enabled a district previously most inconveniently situated in regard to rail traffic to be placed in communication with the Callander and Oban Railway at Connel Ferry, but provided a means of crossing Loch Etive where hitherto a very lengthy detour had to be made to get from one side to the other, the only alternative being a very uncertain ferry service.

The difficulty having been solved from the railway point of view, there still remained the problem of providing for the transit of motor cars and other road vehicles across the Loch, and for several years after the opening of the bridge the Caledonian Railway conveyed private motor cars across the bridge by placing them on flat trucks and hauling them, passengers included, by road motor vehicles adapted to run on rails across the bridge.

This method, as indicated, was continued for a considerable time, but, several years ago, the Caledonian Railway Company adopted the alternative method of adapting the bridge also for the passage of motor vehicles, cycles, &c., under their own power. There is not, however, sufficient room for a roadway clear of the railway track, so that it is necessary to restrict the passage of road vehicles to periods when no train is signalled. At each end of the bridge, therefore, gates under the control of the bridge-keeper are provided to close the bridge to road traffic when a train is due, and the tablet instruments are controlled by electric circuits in connection with the road gates to ensure that unless the gates are properly closed a tablet cannot be used. The roadway comes close up to the railway rails, there being just sufficient room for a vehicle to traverse the bridge, though the bridge-keeper has to see that vehicles from both directions are not allowed at the same time. These facilities apply only to private motor cars and horse-drawn vehicles, but not to trade vehicles of either class. Provision, is however, made for its use by cyclists and by pedestrians. In each case the crossing of the bridge is subject to toll, the men in charge at the Connel Ferry and Benderloch ends acting as toll-keepers.

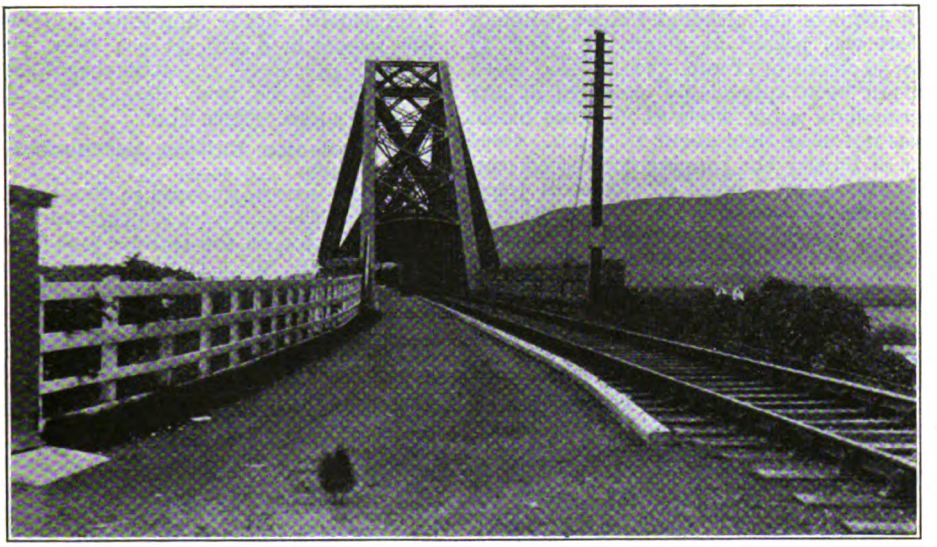

Photo.] **CONNEL FERRY BRIDGE, CALEDONIAN RAILWAY.** [*J. F. Gairns.*

Showing roadway for road traffic alongside rails.

It may be mentioned that, in August last, the bridge was thus used by 6,009 foot passengers, by 852 motor cars, and by 290 cycles.

Mr. Whitelegg's 4-6-4 Tank Engines at Work.

THE well-known Glasgow–Ayr 50-minute non-stop express, 8.25 a.m. from Ayr and 5.10 p.m. from Glasgow (St. Enoch), is now worked regularly by engines of Mr. R. H. Whitelegg's express tank engine class. The route, while not very severely graded, is complicated by numerous junctions, and in the Glasgow district high speed cannot be made for the first few miles after leaving St. Enoch. Hence the allowance of 50 min. for this run of 41½ miles calls for a high standard of performance. The corresponding Saturday train at 12.30 p.m. from St. Enoch

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is allowed 55 min., but calls also at Paisley. These trains have also Girvan portions.

In view of the special interest attaching to the running of these trains, the following notes of a journey by the 5.10 p.m. from Glasgow will be of interest, especially in view of the fact that, as the Ayr Race Meeting was in progress, the train was delayed in running into Ayr in accordance with the special restrictions in force, and yet arrived well before time. The engine was No. 541, of the 4-6-4 tank class, and the load seven bogie coaches and a restaurant car. As there was a full complement of passengers the load was a good 230 tons. Wind was light and weather conditions generally favourable. Leaving punctually, easy running was the order for some distance, and although Paisley (Gilmour Street) was passed at about 50 m.p.h. (7 miles 56 chains in 11 min. 35 sec.), that speed had not been appreciably exceeded at any intermediate point, while at Eglinton Street it was not more than about 25 m.p.h. Once clear of Paisley the running smartened considerably. The 3 miles 16 chains to Johnstone occupied 4 min. 5 sec., the 7 miles 58 chains thence to Beith, 8 min. 45 sec., and Kilwinning was passed at about 65 m.p.h. in 8 min. 5 sec. from Beith (8 miles 14 chains), and 20 min. 55 sec. from Paisley (19 miles 8 chains). Onwards to the old platform at Troon, 8 miles 7 chains, occupied 7 min. 45 sec., speed reaching up to 65–70 m.p.h., and Prestwick (3 miles 32 chains) was passed, still at high speed, in 3 min. 15 sec. At Newton-on-Ayr it became necessary to ease off and to whistle for signals, but that station was passed in 12 min. 55 sec. from Kilwinning (13 miles 35 chains); 33 min. 50 sec. from Paisley (33 miles 43 chains); and 45 min. 30 sec. from St. Enoch (40 miles 19 chains). Checks then brought us almost to a stand at the home signal outside Ayr station, at 5.57.20, but we stopped at the main platform a few seconds after 5.59, still virtually a minute before time. Truly a distinctly good, thoroughly interesting, and in many respects notable run.

Glasgow to Kilmarnock.

A TRIP behind an engine of the same class from St. Enoch to Kilmarnock may also be outlined, on the 10.45 p.m. night express for the south. No. 545 had a load of about 240 tons, made up of 1 sleeping car, 5 joint stock bogies, 1 Glasgow and South Western Railway bogie and a 6-wheeled joint stock van. Weather was generally favourable, except for rain. As the route is very severely graded for much of the distance, this load was a good one, even for so powerful an engine. After a smart start, Kennishead (4 miles 47 chains) was passed in 5 min. 40 sec., at about 55 m.p.h., and, despite the severe grades which follow to Barrhead, the joint station was passed at almost 50 m.p.h. in 5 min. from Kennishead (3 miles), and 10 min. 40 sec. from Glasgow (7 miles 47 chains). On the 1 in 67, 78, 69 and 70 grades which follow, speed was well maintained, Neilston being passed at about 40 m.p.h., while to the summit approaching Caldwell it did not drop below 30 m.p.h. Over the summit speed was a good 50 m.p.h. through Caldwell (12 miles 59 chains from Glasgow, 18 min. 55 sec., and 5 miles 12 chains from Barrhead, 8 min. 15 sec.), and the fairly easy though mainly rising run of 3 miles 76 chains to Dunlop was made in 4 min. 55 sec. A summit just beyond Dunlop leads to the descent to Kilmarnock, but this is too steep to permit of excessive speed, and so, with intermediate brake application, Kilmaurs was passed in 5 min. 45 sec. from Dunlop (5 miles 35 chains), and Kilmarnock reached in 32 min. 50 sec. from Glasgow (24 miles 28 chains), 2 min. before time.

Old Caledonian Railway Locomotives still at work.

IN reference to remarks in the September RAILWAY MAGAZINE by Major Munro, anent traffic working on the Dundee and Arbroath Joint Railway, Mr. J. D. Sherriff, of Arbroath, writes: "The incident to which he refers, namely, of having seen a D. and A. joint train headed by both a Caledonian and a North British engine, is in no way unusual when light engine working is thereby saved. The old 0–4–2 Caledonian engine shunting the Arbroath yard at present is No. 1670, which recently took the place of a similar engine No. 1255. Quite a number of these engines are still extant and work regularly on passenger trains in the Glasgow district. Recently at Glasgow Central station I saw Nos. 275, 264 and 1488 of that class, while at Dundee there are Nos. 1255, 1674 and 1676, and they are still capable of much good work. I see an old Oban bogie, No. 1184, passing here every morning on a Dundee to Forfar goods train and recently she has been taking no mean loads. Practically all the 2–4–0 engines are scrapped now—the last of O'Connor's excellent 7 ft. drivers has gone in the shape of 1035 which was spare engine at Forfar for many years. The small Drummond 0–4–4 tanks—built between 1884 and 1891—still take a fair share of the work here. No. 191 is at present working the Carmyllie Light Railway, as well as doing a trip to Forfar and back in the evening—in fact the two fastest trains in the day between Arbroath and Forfar are worked by that veteran. There has been a great dearth of McIntosh 0–4–4 tanks at Forfar this summer and a great deal of the local traffic is being worked by small 0–6–0 engines, built in 1896. No. 581 and 202 of that class are stationed at Arbroath."

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End of the North British Dispute.

THE facts relating to the settlement of the long-standing dispute between the North British Railway Company and the Ministry of Transport were clearly explained by the Chairman to the shareholders at the adjourned annual meeting held on Friday, November 17. This dispute, commencing in January, 1921, and involving the dividends of 1920, gradually developed until at the end of the control period it covered two things—first, a refusal by the Ministry to pay £1,120,000 claimed by the company in respect of the years 1920 and 1921, and a retention by the Ministry of that sum in their settlements with the company; and, secondly, a somewhat indefinite claim by the Ministry to a repayment of £1,000,000 alleged to have been overpaid to the company during previous years. From Mr. Whitelaw's statement it is clear that the Ministry has now recognised the correctness of the principle contended for by the company, although, in strict law, according to the decision given on appeal by the Court of Session, the proceedings should have been postponed until after the control period. As a consequence of this settlement the directors are now in a position to pay the postponed dividends of 1920 and to recommend the declaration and payment of the postponed dividends of 1921.

The other part of the dispute stands on quite a different footing, involving somewhat complicated issues, and was settled on the basis of a repayment of £405,000, all questions of interest being waived; this repayment will be reflected in the accounts for 1922. The North British will take into the Amalgamated Company assets reduced by £405,000 from those appearing in the balance sheet of the last annual report, and the North British has secured the assent of its partners to this reduction in its contribution to the total reserve funds of the amalgamated company.

Reduced First-class and Excursion Fares.

REFERENCE has already been made concerning fare reductions effective from January 1, 1923. Among the important changes is the adoption of 2½d. per mile as the usual basis for first-class fares, as compared with rates which have ranged from 3½d. to as much as 4½d. per mile, a measure which will undoubtedly do much to retrieve the fall in first-class travel which was becoming so serious, particularly in respect of lengthy journeys. With the disappearance of the second-class on main line journeys, the adoption of an intermediate rate instead of the double-third basis will, no doubt, bring the first-class into favour again, where superior comfort, more space, freedom from overcrowding, and other considerations justify a reasonable expenditure beyond that of third-class fare. In many instances the reductions become substantial, ranging from 11s. 7d. for the London–Birmingham return journey, to 33s. 7½d. in the case of Aberdeen, and 44s. 7½d. from London to Inverness and back. Attention may also be drawn to the fact that the railway companies redeemed the half-promise given in October that, if practicable, though the reduction in third-class fares was not due until January 1, they would endeavour to base the Christmas excursion fares upon the fares of the New Year. Thus, the excursion arrangements announced for the Christmas holidays were, as compared with those of Christmas, 1921, reduced to the extent of 14s. between London and Inverness, 13s. 3d. to Aberdeen, and proportionately for shorter journeys, the minimum, being, however, 20s.

Mr. Felix J. C. Pole on Grouping.

IN proposing the toast of "The County Borough, Port and Trade of Swansea," at the annual banquet of the Swansea Chamber of Commerce on Friday, November 24, Mr. Felix J. C. Pole, General Manager, Great Western Railway, pointed out that not only would some 200 companies be reduced to four, but all the companies except the Great Western were to be wound up, and early in the New Year all the old familiar names would have disappeared except that of the Great Western Railway. Whatever view might be held as to the policy of grouping, it was certain that the situation in which the railways found themselves after seven years of Government control called for drastic treatment. In 1913, the last complete year before Government control, the total expenditure was 75 millions. By the year 1918 it had risen to 131 millions, and in 1920, the last complete year of control, to 228 millions. Moreover, at that time, costs were still rising. By far the largest part of that enormous increase of expenditure was due to wages concessions, and the introduction of the eight-hour day. The Government were forced to make railway receipts balance the expenditure, and his hearers were aware of the extent to which railway rates had been advanced at one bound in January, 1920. In his opinion, the Government lost a great opportunity of raising money when they failed to advance railway rates concurrently with the growth of expenditure during the years 1916-20. They might have secured many millions to the relief of taxation, and, incidentally, have demonstrated that the bargain with the railways was an exceedingly good one for the State.

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Grouping to Produce Economies.

Mr. Pole, continuing his address, remarked that after the war, rates were advanced, but the growth of expenditure had been so great that the Government recognised that something drastic had to be done. The policy of grouping was therefore adopted "to enable economies to be effected." Only on the basis of their working efficiently and economically were the companies to be secured a modest return on the capital invested in them, the basis being the net receipts for the year 1913. As regards labour, machinery had been provided for enabling the men and the officers and directors to meet together to discuss matters in which they were mutually interested; and, incidentally, he hoped that they had seen the last of strikes in the railway world. Finally, the trader, who had to "pay the piper," had been given a new tribunal, to which he could appeal in regard to railway rates, and which had to fix standard charges.

To-day, despite reductions of both items, railway expenditure and railway rates were still too high. The Great Western and other railways believed in the principle of a good day's pay for a good day's work; but they also realised that no industry could prosper without paying at least a modest dividend to the proprietors, while the price of any commodity was limited to its commercial value. Under the Railways Act, railway companies were limited in the profit they could make, and it followed that any excess could only be divided between the traders and the employees. Each of those parties was therefore interested in the welfare of the railways; the traders because the more traffic they put on the railways, the lower would be the rates and charges, and the staff, because, only by more efficient and economical working would the railways be able to pay higher wages than they did before the war. In short, there was a mutuality of interest between the companies, the traders and the men such as had never existed before, and he was most sanguine that this mutuality of interest, coupled with the formation of the Great Western Group and all that that entailed, would be of the utmost benefit to the trade and commerce of the town and port of Swansea. The directors had already voted over £250,000 to provide a new station, and they had responded to the invitation to take over the docks.

International Traffic at Lugano.

Mr. C. Hutchinson sends particulars of some of his observations on traffic working at Lugano, Switzerland, based upon experience during a stay of some weeks. As his remarks introduce several matters of interest, they may be quoted as follows: "The station is open to anyone who likes to go and watch the trains, an unusual thing on the Continent. Being on the main line from Basle to Milan some most interesting trains pass through, drawn by the splendid electric engines of the Swiss Federal Railways. Of course, some of the best trains pass through in the night, but the 3.50 p.m. to Basle is an interesting train, made up of a six-wheeled van, Milan to Basle; a Heitz wagon; a through bogie first and second-class coach, Genoa to The Hague via Basle, Frankfort and Cologne; a through bogie coach, Genoa to Ostend via Basle, Strassburg, Luxemburg and Brussels; an International Company's sleeping car labelled Constantinople, Milan, Ostend; a through Eastern of France bogie coach, Milan to Paris; a restaurant car, Milan to Basle; a travelling Post Office, Milan to Basle; and a through bogie coach, Genoa to Zurich. This train is drawn by one electric engine, and generally arrives a couple of minutes before the booked time. The 9.8 a.m. from Basle, due at Lugano 3.10 p.m., is an even heavier train, consisting of a four-wheeled Heitz wagon, three-six-wheelers, and nine heavy bogie coaches, including a through carriage from The Hague to Genoa, and a restaurant car. It is sometimes a little late, due probably to the International connections at Basle. The travelling on these trains is smooth and easy. The hill climbing is done by these engines without any of the straining and panting of a steam locomotive. Only one locomotive is used, even with trains weighing well over 300 tons on the continuous gradients of 1 in 34

"Recently 180 railway officials of all countries met at Lucerne and made a special trip to Lugano for the purpose of observation. The train was booked to leave Lucerne at 8.0 a.m. and to run non-stop to Lugano, 121 miles, arriving at 10.56 a.m. I saw it arrive at 10.51 a.m., and I was told it left Lucerne several minutes late, so it must have completed the run in about 2 hours 45 minutes, an average of well over 40 miles an hour. It consisted of a dynamometer car and six bogies, and it must have been a better run than that mentioned in the Railway Magazine by the special train for the King of the Belgians from Rome to Brussels. Lover of the steam locomotive as I am, I am bound to confess that I think these electric locomotives can do things which would be quite impossible for a steam engine, on gradients of 1 in 38 for 20 miles on end. The running both up and down hill is smoothness itself, even on the very sharp curves."

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As we go to press it is officially announced that the directors who will form the Board of the London and North Eastern Railway Company have decided to make the following appointments :

Subject to the responsibility of the Chief General Manager (Mr. R. L. Wedgwood) :—

Mr. J. Calder, General Manager of the North British Railway, to be General Manager, Scottish Area.

Mr. Alexander Wilson, Assistant General Manager and Chief Goods Manager, North Eastern Railway, to be Divisional General Manager, North Eastern Area.

Mr. S. A. Parnwell, General Manager, Great Eastern Railway, to be divisional General Manager, Southern Area.

Mr. R. Bell, Assistant General Manager, North Eastern Railway, to be Assistant General Manager of the company.

Mr. K. Kerr, Passenger Manager, North Eastern Railway, to be Assistant General Manager (Staff).

London] [*Stereoscopic Co.*

MR. T. SMITH,
Assistant Superintendent of the Line, Great Northern Railway.

Subject to the responsibility of the Chief Legal Adviser (Sir Francis Dunnell, Bt., K.C.B.) for the legal business of the company :—

Mr. Thomas Chew, Solicitor, Great Eastern Railway, to be Solicitor of the company in charge of legal work of a particular nature.

Mr. George Davidson, General Manager and Solicitor, Great North of Scotland Railway, to be Solicitor in Scotland.

Mr. Henry R. Cripps, Acting Solicitor, Ministry of Transport, to be Chief Assistant Solicitor.

The following additional appointments are also announced :—

Mr. James McLaren, Secretary, North British Railway, and Mr. G. F. Thurston, Secretary, Great Eastern Railway, to be Joint Secretaries.

Mr. C. L. Edwards, C.B.E., Accountant, Great Northern Railway, to be Chief Accountant.

Mr. James A. Campbell, Secretary, Great Central Railway, to be Registrar.

Mr. W. Clow, Superintendent of the Line, Great Central Railway, to be Superintendent (Southern Area).

Mr. C. J. Selway, Superintendent of the Line, Great Northern Railway, to be Passenger Manager (Southern Area).

The directors have decided that the head office of the company shall be at Marylebone Station, London.

* * *

MR. T. SMITH, who has been appointed Assistant Superintendent of the Line, Great Northern Railway, entered the service of the Stafford and Uttoxeter Railway in 1880, and was transferred to the Great Northern service on August 1, 1881, when the line was purchased by the Great Northern Railway. After filling clerkships at Stafford, Ramsey and Stroud Green, he was, in 1886, transferred to the Claims Department. In 1894 he was made stationmaster at Sandy, and on the reorganisation of the Traffic Department in 1902 was transferred to King's Cross as

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stationmaster. In 1904 he became Assistant Divisional Superintendent, and in 1911 Divisional Superintendent of the Southern Division, London (including the City and Docks Goods Depôts) to Werrington Junction, north of Peterborough, and the intermediate branch lines.

* * *

IN the board room of the South Eastern and Chatham Railway at London Bridge, a presentation has been made to three members of the General Manager's staff—Mr. G. F. Cole, Mr. A. E. Dixon, and Mr. W. R. Latta—who are retiring, each having served the company for over 45 years. The presentation took the form of two handsome clocks and a suit case, and was made by Mr. G. B. Hayne, Assistant to the General Manager, who expressed on behalf of Mr. P. C. Tempest, General Manager, his appreciation of the work done by the three retiring members, and his regret at losing their services.

* * *

MR. JAMES COWIE, who retired recently from the position of Manager and Secretary of the Midland Railway (Northern Counties Committee), at a meeting of the Railway Managers' Conference of the Irish Railway Clearing House, has been made the recipient of a handsome presentation in the form of an ivory-mounted fitted gentleman's suit case, together with a case of lady's ivory toilet brushes. Mr. E. A. Neale presided, and spoke eloquently of Mr. Cowie's many good qualities. Mr. Walter Baird spoke on behalf of the Shipping Companies, and Mr. H. Hunt contributed remarks on behalf of the smaller Irish railways. After a tribute paid by Mr. Ingram, Transport Department, Ministry of Industry and Commerce, Mr. Cowie suitably replied.

* * *

MRS. S. A. PARNWELL presided at the second Bohemian Concert of the 1922–23 season of the Great Eastern Railway Musical Society, held at the Hamilton Hall, Liverpool Street Station Hotel. In thanking her, Colonel Galloway added his congratulations to the London and North Eastern Railway on having appointed Mr. Parnwell General Manager of the Great Eastern section. The concert was a great success. Arrangements generally were in the hands of Mr. A. W. Headley, General Secretary of the Society, assisted by Mr. J. V. Gosling, Librarian. Mr. E. A. Evans was in charge of the publicity portion of the preliminaries.

* * *

THERE was held recently at the Great Eastern Hotel, Liverpool Street, E.C., the first annual dinner of the Great Eastern Railway Old Comrades' Association. The hon. secretary of the Association is Mr. C. J. Ash, of the General Manager's office, and its objects :

(1) To foster that feeling of *Esprit de Corps* which existed among all ranks of the service during the Great War.
(2) To assist the widows and orphans of fallen Great Eastern Railwaymen.
(3) To arrange reunion and other social functions to meet the wishes of members.

Membership is open to all Great Eastern Railway employees who have served in the Navy, Army, Air Service or any auxiliary force. Branches have been formed in various parts of the Great Eastern Railway Company's system, viz., Yarmouth, Norwich, Cambridge and Parkeston, and others are in course of formation. The membership is 1,200. There are over 500 orphans under the age of sixteen, and a sum exceeding £2,000 has been distributed to these children since the fund was started in November, 1920. In addition to this orphan fund, the Association has a distress fund, from which it helps necessitous cases, such as members who have fallen on evil times in consequence of discharge due to reduction of staff, and other needy cases which do not come within the scope of the Widows' and Orphans' Fund. At the dinner, Major A. C. Chauncy presided, and Mr. S. A. Parnwell, General Manager, proposed the toast of the evening, "The G.E.R.O.C.A."

* * *

A MEMORIAL service to Mr. Charles Colin Macrae, the late Chairman of the London, Brighton & South Coast Railway, was held on December 1 at St. Jude's Church, Kensington. The Brighton Railway was represented by Lord Henry Nevill (Deputy Chairman), Mr. Gerald W. E. Loder (Director, since elected Chairman), Mr. Dudley Docker, C.B. (Director), Mr. C. L. Morgan, C.B.E. (Director), Mr. J. Ford (Auditor), Mr. J. J. Brewer (Secretary), Sir William Forbes (General Manager), Mr. E. J. Readdy (Assistant General Manager), Mr. O. G. C. Drury (Engineer), Mr. H. A. Sire, C.B.E. (Goods Manager), Mr. C. A. de Pury (Accountant), Mr. L. B. Billinton, C.B.E. (Locomotive Engineer), Mr. F. A. Pinfold (Estate and Land Agent), Mr. W. Blair (Rating Agent and Surveyor), Mr. R. H. Houghton (Electrical Engineer), Mr. C. Cooper (Continental Traffic Agent), Mr. E. C. Rutherford (representing Mr. E. A. Scanes, Solicitor), Mr. F. T. Roach (Station Superintendent at Victoria), and Mr. H. Langridge (Station Superintendent at London Bridge), and Mr. R. Wilks (a former servant of the company).

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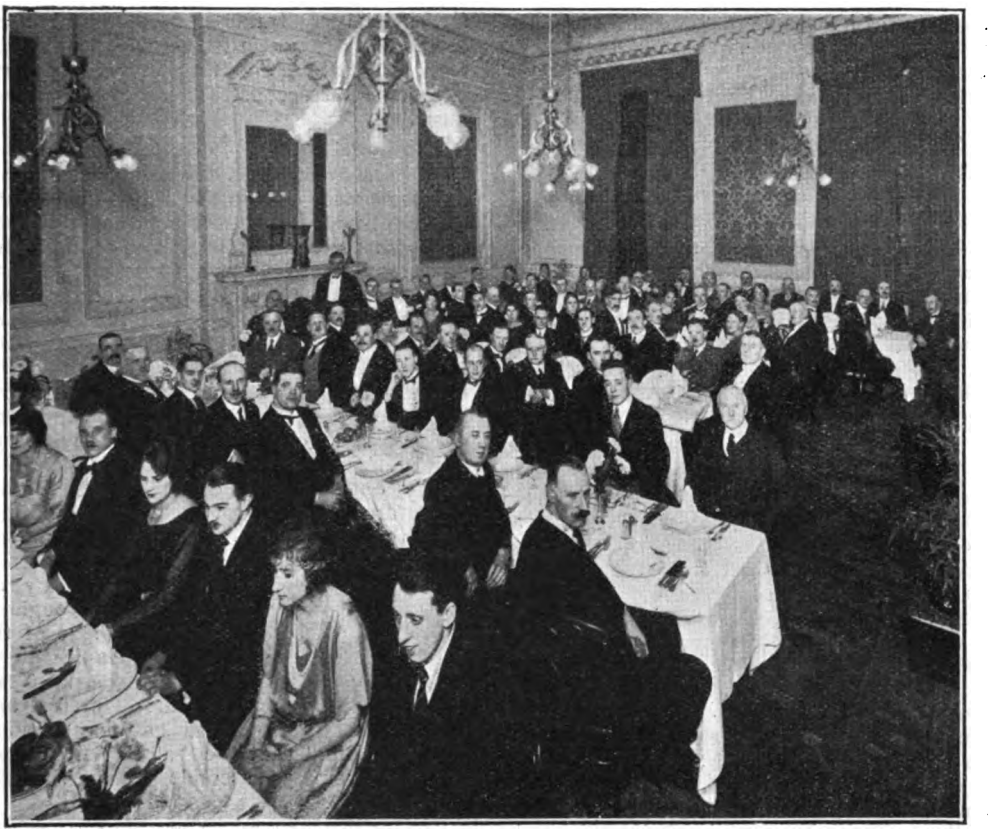

METROPOLITAN RAILWAY.
Fourth Annual Dinner of the Traffic Manager's Staff, at the Holborn Restaurant, November 24, 1922

A COMPLIMENTARY dinner has been given at Aberystwyth to Mr. Samuel Williamson, late General Manager, Cambrian Railways. Among those present were Mr. A. Herbert (a director of the company) and Mr. Felix J. C. Pole, General Manager of the Great Western Railway.

* * *

MEMBERS of the Secretary's staff of the Great Central Railway held their annual dinner at Pritchard's Restaurant, Oxford Street, W., on December 1. More than ordinary interest was taken in this annual event owing to the approaching demise of the railway company, which is to be merged in the London & North Eastern Railway. Among the guests, some of whom had been associated with the Secretary's department in former years, were Mr. Harry Thorpe (late Assistant General Manager, Ceylon Government Railways), Mr. Guy Taylor (Reading), Mr. Clarke (Leicester), Mr. William Slade (Harrow), Mr. Edwin Livesley, O.B.E., Assistant Goods Manager, Great Central Railway, Mr. T. W. A. Lingard (General Manager's department), and Mr. W. H. Edge, late of the Secretary's office, Marylebone. The chair was occupied by Mr. A. R. Lamb (Chief Assistant to the Secretary), and, after the usual toasts had been proposed and responded to, Mr. W. H. Edge proposed the health of the chairman.

* * *

IT has been arranged by the board of the Railway Benevolent Institution, with the concurrence of the railway companies, that on Monday, January 1, the usual collections shall be made from the staff and the public at all railway stations in the United Kingdom. The more immediate object of the New Year's Collection is for the Casualty Fund, to which in the year 1922 upwards of 195,000 railway servants contributed, and from which claims to the number of 4,778 have been promptly relieved.

* * *

DURING the month of November, 1922, 340 suggestions were received by the London Underground management from its staff.

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Seventeen of these were successful and suitable awards were made in each case. Among the suggestions were :—

(1) Economy in lighting, Maida Vale station : Booking clerk.
(2) " Safety First " slogans : Clerk.
(3) Balance weights to show lift numbers : Fitter's mate.

* * *

In connection with the Institute of Transport, the third ordinary meeting of the current session will be held in the Lecture Theatre of the Institution of Electrical Engineers, Victoria Embankment, W.C. 2, at 5.30 p.m., on Monday, January 1, 1923, when a paper will be read on " Air Transport," by Mr. F. Handley Page.

* * *

Traffic qualification for the issue of traders' season-tickets will be reduced from £600 to £500 per annum for each ticket as from January 1, 1923. Thus the qualification is reduced one-half from that adopted on September 1, 1920, upon the recommendation of the Rates Advisory Committee. It is worthy of remark that it was laid down in 1888 that, to qualify for a traders' season-ticket, a business man was required to give freight to a railway to the extent of £300 per annum. This was the standard figure on both the English and Scottish lines, and it was not altered until May, 1918, when the amount was raised to £500 per annum. Following the increase in freight rates in 1920, the qualification figure was raised to £750 on July 1, 1920, and, two months later, to £1,000 per annum. The first step towards a reduction was taken by the railways in 1921, when they sought a direction from the Ministry of Transport to reduce the qualification from £1,000 to £600 per annum, and the latter figure became operative on August 6, 1921. An exception to the £600 standard was made in connection with the Great North of Scotland and Highland Railways, the figure in these cases being £300 per annum, the general pre-war qualification.

* * *

Messrs. Symington, Son & Co., of St. Vincent Street, Glasgow, have secured a contract with the Great Northern Railway for extensions and improvements at King's Cross station, London. The work involved includes the clearing of an area on the down side, at the south end of Gas Works Tunnel, on ground adjacent to the disused gas works premises, where it is intended to provide new engine sidings, including a turntable capable of taking the large 4-6-2 locomotives now in service, with coaling plant, etc. The area alongside the main station, at present given over to the locomotive department, is also to be cleared, and two additional platforms for suburban traffic provided. Messrs. Symington are concerned principally with the work of clearing and that involved in preparing the respective sites for their new purposes.

* * *

More six-car trains of the latest type are now in service on the Piccadilly Line of the London Underground. The principal feature of these new cars is an improved arrangement of doors. The old type Piccadilly car had but two doorways, one at each end. These end doorways are retained in the new cars, but there is also a 5 ft. 6 in. door in the centre. This overcomes one great difficulty, for whereas passengers were formerly reluctant to pass down the car if they were only travelling a short distance, they do not mind doing so in the new cars, as there is a " way out " in the centre. These centre doors are operated pneumatically, and not until the last door is closed does the motorman receive the signal to start the train. The signal is given automatically by an indicator electrically connected throughout the whole of the doors on each side of the train. The circuit in this indicator is broken unless each door is closed. Tests have been taken of the time of arrival and departure of these new trains at busy stations, and it is found that the " stops " have been reduced from 35 seconds to 25 seconds.

A NEW BOTANICAL POSTER,
" Underground " Railways.

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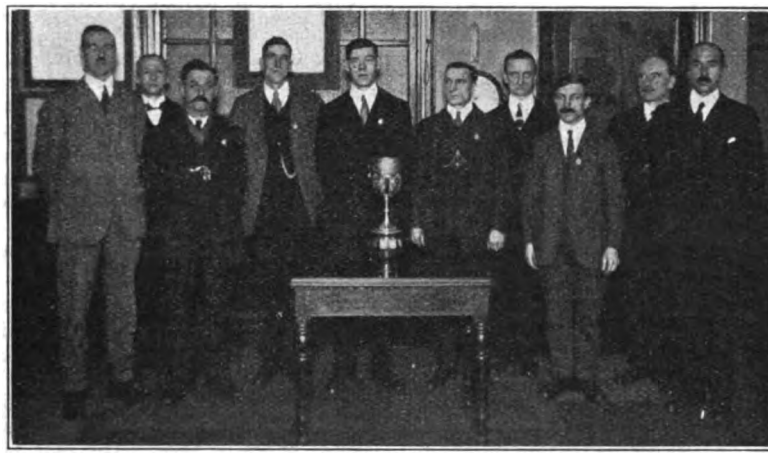
Congestion on both trains and platforms is thereby considerably reduced.

* * *

DURING December a strange and weird poster, depicting familiar pantomine characters, appeared at all stations on the London Underground Railways. The mystery surrounding these posters has been revealed, for there have appeared in the booking halls at Leicester Square, Oxford Circus and other points, small illuminated models of theatres, upon the stages of which strut Robinson Crusoe, Demon Delay, Cinderella, and Jack and the Beanstalk, Heroes and Heroines, Fairies and Brigands, and last but not least, Old Nick. This unfamiliar sight is the outcome of the efforts of Mr. A. Rutherston, the well-known theatrical artist who designed the poster, and Mr. F. J. H. Darton, who wrote a fairy play around the characters and scenes depicted in the poster. The play can be performed in thousands of fireside theatres by "arrangement" with the Underground Railways. The "arrangement" is 2s. for the complete stage, scenery and characters, and they can be obtained from any bookstall or bookshop.

* * *

IN reference to a correspondent's remarks, on page 488 of the December RAILWAY MAGAZINE, in regard to a booking of 19 minutes for the start-to-stop run of 18¾ miles between Birmingham (New Street) and Coventry, a reader points out that, although "C. S. L." may have omitted to notice the references, this timing, since its inauguration in October, 1921, has been mentioned no fewer than five times in the pages of the RAILWAY MAGAZINE, while it was given as the fastest run on the London & North Western Railway in "Voyageur's" article on "British Winter Train Services" in December, 1921, and reappeared in the same position in the corresponding table in October, 1922. Our second correspondent also remarks that the exact distance is 18 miles 74 chains. Journeys in detail with these expresses were described in "British Locomotive Practice and Performance" for March, 1922, and further mention was made in the September, 1922, number. He also directs attention to the fact that, in the case of the 6.20 p.m. from Birmingham, the load would be about 300 tons full, but four vehicles are detached at Coventry, though he would suggest that two would afford more than sufficient extra accommodation over this length. The scheduled load for this train is supposed to be 200 tons, and, according to his experience, it is virtually impossible for a "George the Fifth" class 4–4–0 locomotive to work the 300 tons to Coventry in the exact 19 minutes allowed. On his last trip 75 m.p.h. was attained at Hampton, speed fell only to 65 at Beechwood Tunnel, and 74 m.p.h. was again touched before stopping. But, even then, 5 seconds over 20 minutes were required to complete the run. He suggests that it would be a more practical timing, though less brilliant, to allow 21 minutes for this run, and to reduce the allowance from Coventry to London from 99 to 97 minutes. Our correspondent takes exception to "C. S. L.'s" description of the start from Birmingham as "anything but ideal," his point being that the gradient to commence is



RAILWAY "FIRST-AID" DISTINCTION.

The Electric Traction Staff Ambulance Team, which won the 1922 L.B. & S.C.R. Competition.

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in favour of the train, as there is a full mile down at 1 in 58–113. It is doubtful, however, whether full advantage can be taken of this, in view of the complexities of the route for some distance.

* * *

IN reply to a question in the House of Commons as to the financial results of the attempt by the Government to build locomotives at Woolwich, Colonel Jackson said: Fifty locomotives have been completed at Woolwich at an average cost of £15,600. Work on a further 50 has been suspended at a stage of about 30 per cent. short of completion. The locomotives have been handed over to the Disposal and Liquidation Committee, but, so far, none have been sold, and, therefore, I am not in a position to indicate the loss on the transaction.

* * *

IN a question recently addressed to the Prime Minister, it was suggested that he should make representations to the North British Railway to double the line from Bo'ness to the main line, and to the Caledonian Railway to extend the line from Barnton via Bo'ness to Grangemouth, both of which extensions would assist the industrial development of the district. The answer given on behalf of Mr. Bonar Law was that the question was one for the consideration of the railway companies concerned, and the suggestion was being brought to their notice.

* * *

SEVEN-CAR trains are running on the Central London Railway between Ealing Broadway and Liverpool Street during the rush hours. The record number on the tubes has been six-car trains hitherto, apart from the District Railway. Each car seats 48 passengers. There is therefore total seating accommodation for 336 passengers in the new trains. Since the Central London Railway extension between Wood Lane and Ealing Broadway was opened in August, 1920, the traffic from west London to the City has increased from month to month.

* * *

FROM the London, Brighton & South Coast Railway comes the latest edition of that charming booklet, "Nature's Finest Tonic." This is the last of a long line of excellent holiday literature issued from the Brighton headquarters prior to the grouping of the line with the other constituent companies forming the Southern Railway. Readers, particularly those resident in the North and Midlands of England, who desire for health's sake a mid-winter holiday in the South, will do well to possess themselves of a copy of this very informing booklet, dealing with such places as Bexhill-on-Sea, Bognor, Brighton, Isle of Wight, Eastbourne, Hastings, Tunbridge Wells, Southsea, &c. It is distributed gratuitously from the Publicity Department, General Manager's Office, London Bridge, S.E.

* * *

REFERRING to the article on "French Express Train Services in 1922," Mr. J. E. Norman remarks that the 6.20 p.m. express from Paris (Nord) to Brussels has now been accelerated to cover the 95 miles from the Nord terminus to St. Quentin in 97 minutes, only 2 minutes slower than the best pre-war schedule, although the long slack for reconstruction north of Chamy, to which "Voyageur" refers, is still included. The load varies from 300 to 330 tons.

* * *

A COVENTRY reader (Mr. E. J. Gilman) writes of a remarkable load he saw hauled by a London & North Western Railway "Jumbo" engine one day recently. The locomotive was hauling the 6.40 p.m. train, Rugby–Coventry–Birmingham, and had a load of twelve corridor coaches and two parcel vans. The "Jumbo" in question was No. 1187, *Chandos*, of Stafford shed.

* * *

THE incoming Wirral afternoon train from West Kirby was in collision with an outgoing train of the same company at Birkenhead Park station on December 6. A passenger seated in an invalid's chair in the van of the latter train died subsequently from shock. This is the first fatal accident in a passenger train that the Wirral line has had.

* * *

MESSRS. WILLIAM BEARDMORE & CO., LIMITED, whose locomotive works are at Dalmuir, near Glasgow, have received a contract for five heavy and powerful locomotives of the Mallet articulated type, metre gauge, for the Burmese Railways.

* * *

DURING the week commencing Monday, November 20, a film depicting the Kearney High-speed Railway was exhibited at the Electric Pavilion, 222, Lavender Hill, London, S.W. 11. Mr. Kearney explained his system, and a working model of the railway was on exhibition in the entrance hall.

* * *

MR. F. H. STINGEMORE is to lecture on "Advertising in Transportation" at the Institute of Transport Metropolitan Graduate and Student Society's meeting at the Institution of the Electrical Engineers, Victoria Embankment, W.C.2, on Tuesday, January 9, at 6 p.m. Mr. Stingemore is known to our

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readers as a frequent contributor of photographs for the illustration of the RAILWAY MAGAZINE.

* * *

A STAFF canteen, replacing the somewhat makeshift premises previously supplied, located near the Dingwall Road entrance to East Croydon Goods Yard (*see* RAILWAY MAGAZINE, November, 1920), was recently opened by Mr. H. A. Sire, Goods Manager, London, Brighton & South Coast Railway, who was supported by Mr. W. F. Pollott, late Assistant Secretary of the Company, by Mr. W. Silvester, Goods Agent at East Croydon; Mr. F. A. Pinfold, Estate Agent, and various other railway officers and members of the staff at East Croydon. Mr. Pollett, as president, introduced Mr. Sire, while Mr. Silvester reviewed the history and progress of the canteen movement since its inception in 1902, the first canteen having been opened on January 12, 1903. In May, 1906, the premises were enlarged to twice the original size, and in December, 1917, steps were taken to remove to larger and more suitable premises. Mr. Sire spoke of the value of canteens of the kind under notice, and hoped that that at East Croydon would be the forerunner of many on the system. Mrs. Sire then declared the canteen open.

* * *

A RETURN compiled by the Ministry of Transport shows that the total staff employed by the railways in Great Britain, including the Railway Clearing House, during the week ended March 25, 1922, was 676,802, as compared with 735,870 during the week ended March 19, 1921, a decrease of 59,068, or 8·03 per cent. The decrease in the number of women employed was 3,965, or 14·5 per cent. Details are given of the number employed in each of the principal grades for 33 companies, with totals for each company and for Great Britain. The return shows that in the 1922 period, as compared with the 1921 period, the number of clerks has been reduced from 90,333 to 85,733; engine-cleaners from 20,364 to 14,929; drivers and motormen from 37,400 to 35,854; goods guards from 18,095 to 16,188; passenger guards from 9,078 to 7,886; permanent way men from 68,377 to 63,021; goods porters from 23,559 to 17,571; passenger porters from 32,812 to 27,552; shunters from 19,081 to 17,685; and signalmen from 30,736 to 29,798.

* * *

AT the Railway Club general meeting at headquarters, 65, Belgrave Road, S.W.1, on Friday evening, December 8, Mr. C. H. Palmer gave a paper on "Railways of Germany and Central Europe," a subject with which he is closely acquainted. The annual club dinner was held at the Feathers Hotel, Broadway, Westminster, S.W.1, on Friday evening, December 15, under the presidency of Mr. Cecil J. Allen. The musical arrangements were in the able hands of Mr. Basil M. Bazley, and, as in former years, the function was most enjoyable. January is to see two important gatherings at the Club rooms. On Friday evening Mr. W. J. Bassett-Lowke, of model locomotive fame, is to give a lantern lecture on "Railways in Miniature," and on Friday evening, January 26, a paper will be presented by Mr. M. M. Niven, "The Glasgow and South Western Railway and its Locomotives, 1860–1914." Mr. Niven has made a special study of Scottish locomotive history, and of the railway in question he has for many years been a close observer.

A NOVELTY IN RAILWAY STATION SHOPS.

A shop in a central position on the concourse of Waterloo Station, London & South Western Railway, has been opened by a well-known firm of Chemists.

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A SPECIALITY of interest to "Full Size" railway enthusiasts is the "super-detail" type of model, introduced by the Leeds Model Company Limited, Balm Road Mills, Hunslet, Leeds, on which all the external details of the original are copied exactly to scale. This firm has a great reputation as manufacturers of scale model clockwork and electric locomotives, coaches, wagons, signals, and all accessories for model railways. Particulars of their productions are given in a new illustrated catalogue which is supplied to applicants post free on receipt of 1s. 6d.

* * *

FROM Bassett-Lowke Limited, Northampton, has come a new edition of section "B" of the firm's catalogue devoted to stationary engines and boilers, dynamos, working models, engine and boiler fittings, castings and material for making railway engines. The numbers of the models have been revised and the prices reduced. In the castings section, a considerable number of new patterns have been added. Injectors, which were such a popular line among model locomotive and boiler builders in pre-war times, are listed again and the firm are now making them in two sizes. The catalogue contains particulars of Bassett-Lowke's "Oracle" wireless receiver. This instrument, which is made throughout at Northampton, is simple to work, is self-contained and sufficient by itself for local broadcasting and amateur transmissions. It will receive telephony up to 30 miles and, under specially favourable conditions, for much greater distances, telegraphy up to 100 miles. The catalogue is priced 1s. 6d.

* * *

RAILWAY statistics for the month of September have been published and can be obtained at H.M. Stationery Office (price 2s. 6d.). They show that the total number of passenger journeys (excluding season ticket holders) in September, 1922, was 102,157,077, a decrease of 2,489,149, or 2·4 per cent., compared with September, 1921. The reduction in journeys at full fares was 8,411,042 or 12·1 per cent., and in workmen's journeys 1,269,981, or 4·9 per cent., but journeys at other reduced fares (*i.e.*, excursion, week-end, cheap day, &c.) increased by 7,191,874 or 79·2 per cent. The following decreases were recorded in receipts:—Passengers, £536,460, or 7 per cent.; season tickets issued £6,020 or 0·5 per cent.; parcels and miscellaneous traffic conveyed at passenger train rates, £53,795, or 3·8 per cent. The passenger train miles run were 1,692,898 more than in September, 1921, an increase of 8·6 per cent. The weight of freight traffic conveyed in September, 1922, viz., 28,476,396 tons was greater than in any month since September, 1920, and represented an increase of 5,176,498 tons, or 22·2 per cent., over September, 1921. The tonnage of general merchandise remained stationary, but coal, coke and patent fuel increased by 4,239,010 tons, or 29 per cent., and other minerals by 920,507 tons, or 25·2 per cent. The tonnage of coal, coke and patent fuel (18,844,821 tons) exceeded the figures recorded for any month since monthly particulars became available for January, 1920. Shipments for export and foreign bunkers, in September, 1922, amounted to 4,256,470 tons more than in the corresponding month of 1921.

* * *

THE "train de luxe" service between Hook of Holland and Berlin in connection with the Harwich boat train, recently announced by the Trans-European Company Limited, leaves Hook of Holland on Tuesdays, Thursdays and Saturdays and Berlin on Mondays, Wednesdays and Fridays.

* * *

FROM the Metropolitan Railway comes a charming Calendar for 1923. Printed in attractive colours the picture portrays a home in Metro-land, as the north western country districts near London served by the Metropolitan Railway are aptly termed. The Calendar carries a "Metro" message for every month in the year and each one of them contains information of value to Londoners generally, but particularly those who are looking for new homes. Applications for copies of the Calendar should be made to Mr. John Wardle, Commercial Manager, Baker Street Station, N.W.1.

* * *

WITH reference to a note on page 241 of the September issue of the RAILWAY MAGAZINE regarding the exchange of London and South Western and Great Central locomotives at Oxford on each weekday afternoon, Mr. E. Little, of Bicester, writes: "It may be of further interest to your readers to know that Great Central locomotives (stationed at Sheffield shed) now work to Swindon arriving at 4.35 a.m. and returning northwards at 9.5 p.m. They also work to the same point on the Sunday Sheffield-Swansea through train. Great Western Railway engines stationed at Oxford work daily to Eastleigh (London and South Western Railway) on the 11 a.m. ex Oxford, arriving back at 5.38 p.m. a 4–4–2 French compound being frequently employed. The outward train appears to have a most liberal schedule allotted to it, over an hour and a-half being allowed for the non-stop run of 60¾ miles from Oxford to Winchester."

* * *

DETAILS of railway grouping arrangements made while we are at press will be dealt with in the February RAILWAY MAGAZINE.

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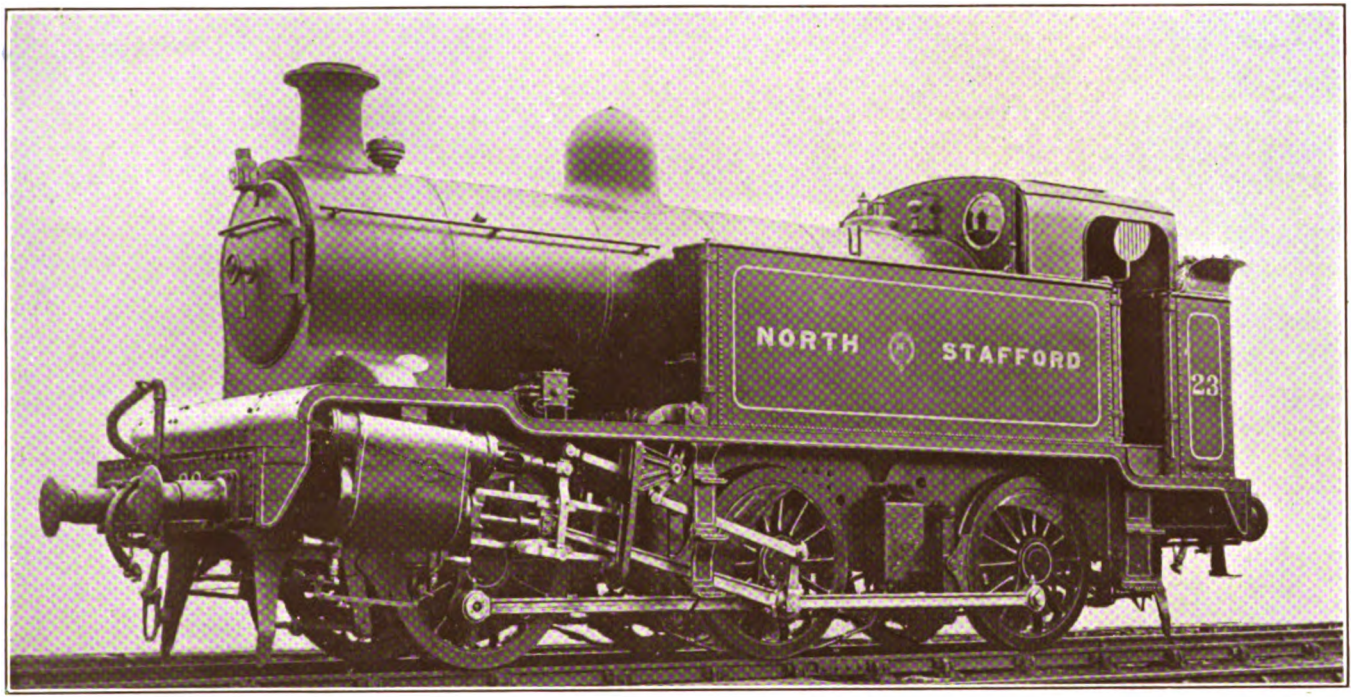

NEW 4-CYLINDER TANK ENGINE, NORTH STAFFORDSHIRE RAILWAY.

Designed by MR. J. A. HOOKHAM, Chief Mechanical Engineer.

Cylinders (4), 14 in. by 24 in. Wheels, 4 ft. 6 in. diam. Wheelbase, 16 ft. 6 in. Works pressure, 175 lbs. per sq. in.
Heating Surface—Small Tubes, 488·64 sq. ft.; Large Tubes, 261·3 sq. ft.; Firebox, 106·76 sq. ft.; Superheater, 195 sq. ft.;
Total, 1051·7 sq. ft. Grate Area, 17·52 sq. ft. Weight in working order, 56 tons 13 cwts.
Designed with inside and outside crank angles of 90 degrees in each case, but each pair at 135 degrees with respect to the other pair.

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HEADQUARTERS OF THE LONDON AND NORTH EASTERN RAILWAY, MARYLEBONE STATION, LATE GREAT CENTRAL RAILWAY.

"The Big Four" of the New Railway Era

INAUGURATING THE NEW RAILWAY SITUATION IN GREAT BRITAIN.

AS from January 1, 1923, nearly all the railways which have for so long supplied the railway transportation needs of Great Britain, have come within the all-embracing scope of one or other of the four "great" companies ordained by the Railways Act of 1921. As a result, the entire railway situation is radically altered, many of the famous "frontier" stations have lost their importance altogether, or merely retain it in a very much reduced and almost incidental form, while railway directorates and officiates are being set up, differing essentially from those of the immediate past, not a few well-known directors and officers passing into well-earned "retirement," while others appear with new and greater responsibilities.

Speaking generally, it is substantially correct to say that, so far, only the combinations of the grouped companies, the formation of the new companies, and the directorates and chief officials concerned with "company" aspects, have yet been completed as far as practicable. Even in this connection, certain amalgamations have yet to be dealt with, and the final schemes submitted for the approval of the Ministry of Transport. Matters are, however, sufficiently advanced to enable the component railways, both "constituent" and "subsidiary," to operate on a combined basis as from January 1, 1923, while a number of both permanent and interim appointments have been made, indicating the prospective organisation. Associated, are a number of retirements of well-known chief officers, and in the aggregate so many developments associated with railway "personnel" have to be recorded, that it is thought best to cover the whole ground in this article, instead of dealing with them individually in the "Railway Portrait Gallery," or "What the Railways are Doing." A number of portraits are

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Photo.] [*Elliott & Fry.*

MR. ARTHUR WATSON, C.B.E.,
General Manager,
London Midland and Scottish Railway.

Photo.] [*Elliott & Fry.*

MR. R. L. WEDGWOOD, C.B., C.M.G.,
Chief General Manager,
London and North Eastern Railway.

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reproduced, and others will be given in later issues. At the same time, although grouping procedure has received attention, stage by stage, the outstanding features of the new railway situation may also be set forth.

I.—London Midland and Scottish.

In this group the London and North Western and Lancashire and Yorkshire Railways were amalgamated as from January 1, 1922, and as we go to press, arrangements for the amalgamation of the North Staffordshire are in process of completion, while in regard to the Caledonian Railway, final stages are also incomplete. Arrangements are, however, sufficiently advanced for the companies concerned to be combined for operating substantially as one concern from January 1, 1923, and the organisation referred to below, though announced as of an interim character, is on that basis.

Constituent Companies.—London and North Western (including Lancashire and Yorkshire, amalgamated from January 1, 1922), 2,667½ miles; Midland, 2,170¾ miles; North Staffordshire, 220¾ miles; Furness, 158 miles; Caledonian, 1,114½ miles; Glasgow and South Western, 493½ miles; Highland, 506 miles.

Subsidiary Companies.—(*a*) *Independently operated lines*: Cleator and Workington Junction, 30½ miles, partially worked by Furness Railway; Knott End, 11½ miles; North London, 16 miles (managed by London and North Western Railway); Stratford-upon-Avon and Midland Junction, 67½ miles; Wirral, 13¾ miles. (*b*) *Independent lines for which rolling-stock, &c., was provided by other companies*: Cockermouth, Keswick and Penrith, 30¾ miles, London and North Western and North Eastern Railways. (*c*) *Non-Working Companies*: (1) Originally leased to or worked by the London and North Western Railway: Charnwood Forest, 10½ miles; Dearne Valley, 21 miles; Harborne 2½ miles; Mold and Denbigh Junction, 15 miles; Shropshire Union Railways and Canal, 29½ miles (part of this system was jointly leased with the Great Western Railway). (2) Originally leased to or worked by the Midland Railway: Tottenham and Forest Gate, 6 miles; Yorkshire Dales (Skipton to Grassington), 9 miles. (3) Originally leased to or worked by the Caledonian Railway: Arbroath and Forfar, 14¾ miles; Brechin and Edzell District, 6½ miles; Callander and Oban, 99¾ miles; Dundee and Newtyle, 14½ miles; Killin, 5½ miles; Lanarkshire and Ayrshire, 36½ miles; Solway Junction, 12½ miles. (4) Originally leased to or worked by the Highland Railway: Dornoch Light, 7¾ miles; Wick and Lybster Light, 13½ miles. (5) Originally leased to or worked by the North Staffordshire Railway: Leek and Manifold (narrow gauge), 8½ miles. (6) Originally leased to or worked by several component companies: North and South Western Junction, 5½ miles; Portpatrick and Wigtownshire Joint, 82½ miles.

Joint Railways (total mileages stated, shares thereof included above).—(*a*) *Now comprised wholly in the London Midland and Scottish Railway*: Ashby and Nuneaton, 29½ miles; Carlisle Citadel Station and Goods Traffic Joint Committees; Enderby, 2¾ miles; Furness and Midland, 9¾ miles; Glasgow, Barrhead and Kilmarnock Joint, 29¾ miles; Glasgow and Paisley, 14½ miles; Lancashire Union, 12¾ miles; Whitehaven, Cleator and Egremont, 35 miles; North Union, 6½ miles; Preston and Longridge, 8 miles; Preston and Wyre, 46 miles. (*b*) *Joint with London and North Eastern Railway*: Axholme Joint, 27¾ miles; Cheshire Lines Committee, 142 miles (one-third share); Dumbarton and Balloch (including Loch Lomond steamers), 7 miles; Dundee and Arbroath (including Carmyllie Light Railway), 23 miles; Great Central and Midland Joint, 40½ miles; Great Central, Hull and Barnsley and Midland Joint (one-third share), 4 miles; Great Central and North Staffordshire, 11 miles; Great Northern and London and North Western, 45 miles; Halifax and Ovenden, 2½ miles; Halifax High Level, 3 miles; Manchester, South Junction and Altrincham, 9½ miles, really a joint working arrangement; Methley, 6 miles; Midland and Great Northern Joint, 183½ miles; Norfolk and Suffolk Joint Committee, 22½ miles (Great Eastern and Midland and Great Northern Joint); Oldham, Ashton and Guide Bridge, 6½ miles; Otley and Ilkley, 6½ miles; Perth General Station Committee (two-thirds share); Prince's Dock, Glasgow, 1½ miles; South Yorkshire Joint, 20½ miles (two-fifths share); Swinton and Knottingley, 19½ miles; Tottenham and Hampstead, 4¾ miles. (*c*) *Joint with Great Western Railway*: Birkenhead, 56½ miles; Brecon and Merthyr, and London and North Western Joint, 6 miles; Brynmawr and Western Valleys, 1½ miles; Clee Hill, 6 miles; Clifton Extension, 9 miles; Halesowen, 6 miles; Nantybwch and Rhymney, 3 miles; Quaker's Yard and Merthyr, 6 miles; Severn and Wye, 39 miles; Shrewsbury and Hereford, 82¾ miles; Taff Bargoed, 11 miles; Tenbury, 5 miles; Vale of Towy,

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MR. R. C. IRWIN,

Secretary,
London Midland and Scottish Railway.

11 miles, owned by London and North Western, but leased jointly; West London 2¼ miles; Wrexham and Minera, 3 miles. (*d*) *Joint with Southern Railway*: Somerset and Dorset, 105 miles. (*e*) *Joint with Great Western and Southern Railways*: West London Extension, 5¼ miles (quarter share). (*f*) *Joint with Metropolitan District Railway*: Whitechapel and Bow, 2 miles.

Irish Lines.—Dundalk, Newry and Greenore, 26½ miles; Northern Counties Committee's lines, 265¼ miles; Joint Midland and Great Northern of Ireland, 91 miles.

Principal statistics consequent upon the completion of grouping are :—Route mileage, 7,790; track mileage (including sidings), 20,100; tender locomotives, 7,000; tank engines, 3,400; coaching vehicles, 27,000; freight vehicles, 315,000; service vehicles, 22,300; electric rolling-stock, 550; rail motor cars, 32. The new company has 67 turbine and screw steamers and a number of smaller vessels, lake steamers, &c.; docks, harbours, wharves, &c., at Barrow-in-Furness, Fleetwood, Garston, Grangemouth, Heysham, Holyhead, Morecambe, Ayr, Alloa, Bristol, Fairlie, Gourock, Largs, London and Tilbury, Renfrew, Troon, Wemyss Bay, Widnes and other places; and 36 modern hotels, mostly of large size and ranking as principal hotels in the towns served.

The new directorate is as follows :—Chairman, Hon. C. N. Lawrence (London & North Western Railway); Deputy Chairmen, Sir Guy Granet (Midland Railway) and Mr. E. B. Fielden (London and North Western Railway). From the London and North Western Railway: Messrs. W. E. Dorrington; Hon. A. H. Holland-Hibbert; W. L. Hichens; J. B. Ismay; J. H. Kaye; G. Macpherson; Sir Thomas Roydon, Bart, C.H.; Sir E. F. Stockton, M.P.; Mr. G. R. T. Taylor; Sir Thomas Williams. From the Midland Railway: Sir J. F. Beale, KB.E.; Sir A. G. Anderson, K.B.E.; Messrs. G. Behrens and C. Booth; General. Hon. Sir H. A. Lawrence, K.C.B.; Messrs. D. Vickers and A. H. Wiggin. From the Furness Railway: Mr. F. J. Ramsden. From the Glasgow and South Western Railway: Mr. C. Ker. From the Highland Railway: Mr. A. E. Pullar. There are five vacancies in the total of 28 permitted by the Railways Act, 1921. Appointments from the Caledonian and North Staffordshire Railways have yet to be made.

The interim organisation set up and already in operation covers the Caledonian and North Staffordshire sections, as well as the railways in regard to which arrangements had been completed before the end of last year. Thus, while Mr. Arthur Watson is, as anticipated, General Manager, Mr. D. A. Matheson, General Manager of the

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Caledonian Railway, takes the title of Deputy General Manager for Scotland, while the department of the Secretary to the new company, Mr. R. C. Irwin, includes Mr. J. J. Haining (Caledonian Railway) as Secretary to Scottish Local Committee and Treasurer (Northern Division).

Mr. Watson has as principal assistant, Mr. H. G. Burgess (London & North Western Railway), and seven other assistants, Messrs. H. Marriott, J. Pike, T. A. Kenyon, Glynne Roberts and W. E. Preston from the London and North Western Railway, together with Messrs. W. Clower and H. V. Mosley, late Assistant General Managers, Midland Railway. In the Secretary's Department, the assistants, in addition to Mr. Haining, are Messrs. M. M. Parkes, C. Chittey, G. Kick and R. C. Willis.

Special interest attaches to the Chief General Superintendent's Department. Three divisions are set up: Western (including the old London and North Western and Lancashire and Yorkshire Railways, and constituent and subsidiary lines within the area of those lines); Midland (the late Midland system with subsidiary lines); and Northern (Scottish lines and Northern Counties system in Ireland). In connection with the setting up of these divisions, all traffic matters are dealt with by this department, the Chief Goods Manager being concerned only with commercial aspects, except for mineral traffic. Mr. J. H. Follows, the well-known General Superintendent of the Midland Railway, becomes Chief General Superintendent; Mr. Ashton Davies is General Superintendent (Western Division); Mr. R. Killin goes from the Caledonian Railway to Derby as General Superintendent (Midland Division); and Mr. J. Ballantyne, also Caledonian Railway, is General Superintendent (Northern Division). Mr. C. R. Byrom is General Superintendent (Passenger Commercial). Mr. F. W. Dingley is Superintendent of Motive Power (old London and North Western Railway), and Mr. Follows is further assisted by Messrs. J. E. Anderson, T. Redhead, H. E. Horne, J. Thompson, W. Sargent and F. Ruffell. Under Mr. Ashton Davies, Mr. T. W. Royle is Assistant General Superintendent (Western Division). Under Mr. Killin, Mr. J. Murray is Assistant General Superintendent (Midland Division). Mr. Ballantyne is assisted by Messrs. M. S. Spier and W. Armstrong, as Assistants to General Superintendent respectively for the Caledonian and Glasgow and South Western sections.

The Chief Goods Manager's Department under Mr. S. H. Hunt (L. & N.W.R.) deals almost exclusively with commercial

Photo.] [*W. W. Winter.*

MR. J. H. FOLLOWS, C.B.E.,

Chief General Superintendent,
London Midland and Scottish Railway.

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MR. H. MARRIOTT,

Assistant to General Manager,
(Parliamentary, Commissioner's Court and Private Siding Arrangements)
London Midland and Scottish Railway.

aspects. There are four Divisional Goods Managers: Midland, Mr. H. F. Loney (M.R.), Derby; London, Mr. W. A. Ree (L. & N.W.R.); Manchester, Mr. W. A. Marsden (L. & N.W.R.); and Northern, Mr. J. Robinson (G. & S.W.R.). Commercial aspects of mineral traffic are, however, dealt with by the Mineral Department, Mr. A. W. Allen (M.R.) being Mineral Manager and Mr. E. Wharton (L. & N.W.R.), Assistant Mineral Manager.

Mr. E. F. C. Trench (L. & N.W.R.) is Chief Engineer of the new company, assisted by two divisional engineers, one for permanent way, present Division "A," Mr. W. H. Williams (L. & N.W.R.); and the other for the present Division "B," Mr. W. H. Coomber (L. & N.W.R.), and four divisional engineers for other sections: Midland, Mr. H. P. Miles (M.R.); Northern, Mr. D. McLellan (C.R.); North Staffordshire Section, Mr. C. G. Rose (N.S.R.); and Furness Section, Mr. D. L. Rutherford (F.R.)

In the Chief Mechanical and Electrical Engineers' Department, Mr. G. Hughes (L. & N.W.R.) becomes Chief Mechanical and Electrical Engineer, and Sir Henry Fowler (M.R.), Deputy Chief Mechanical Engineer. Mr. H. E. O'Brien is Electrical Engineer, while Sir Henry Fowler and Messrs. H. P. M. Beames, G. N. Shawcross, J. A. Hookham, W. Pickersgill, R. H. Whitelegg and D. C. Urie, remain in charge as Mechanical Engineers respectively at Derby, Crewe, Horwich, Stoke-on-Trent, Glasgow (St. Rollox), Kilmarnock and Inverness, a corresponding appointment at Barrow-in-Furness not yet being filled. The Carriage and Wagon Department is similarly organised, Mr. R. W. Reid (M.R.) being Carriage and Wagon Superintendent; with Divisional Carriage Superintendents at Wolverton, Mr. A. R. Trevithick; Earlestown, Mr. W. W. H. Warneford; and Newton Heath (Manchester), Mr. F. E. Gobey.

Two Joint Accountants have been appointed, Mr. J. F. Gee (L. & N.W.R.), and Mr. J. Quirey (M.R.), both now at Euston; with three Divisional Accountants: (1) Derby (addressed officially without name, this being Mr. Quirey's late department); (2) Manchester, Mr. Vernon Gee (L. & N.W.R.); (3) Glasgow, Mr. J. Vallance (G. & S.W.R.). Mr. F. G. Evans (L. & N.W.R.) is Audit Accountant, with Divisional Audit Accountants at Euston, Mr. G. Morton; Derby, Mr. G. H. Doughty; Manchester, Mr. W. Holmes; and Northern, Mr. J. Murray (C.R.). Mr. J. R. Ball (L. & N.W.R.) is

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Land and Estate Agent, with two Divisional Land and Estate Agents: Midland, Mr. H. C. Clay; Manchester, Mr. W. Sadler. Mr. P. M. Payne (M.R.) is Rating Agent, at Derby, with Mr. H. J. Burcham (L. & N.W.R.) as Divisional Rating Agent, London; and Mr. S. W. Beason (L. & N.W.R.), Manchester.

The Stores Department is under four Divisional Storekeepers: present Division "A," Mr. F. D. Stones, Euston; Midland, Mr. T. H. Ward, Derby; present Division "B," Mr. F. S. Sharp, Manchester; Northern, Mr. A. J. Easton, Glasgow (C.R.) Also a District Storekeeper at St. Helens, Mr. G. J. Chesters. Hotels and Refreshment Rooms in England are now in charge, as before, of Mr. S. W. Burleigh at Euston; Mr. A. E. Towle at St. Pancras; and Mr. G. O'B. Hamilton, Liverpool. In Scotland the department is under the immediate supervision of the Deputy General Manager (for Scotland).

Photo.] [*J. Russell & Sons.*

SIR FRANCIS DUNNELL, BART., K.C.B.,

Chief Legal Adviser,
London and North Eastern Railway.

It will therefore be seen that, so far, the only drastic changes are those necessary to enable the component sections to be co-ordinated and to indicate the allocation of authority. Otherwise the appointments continue the old responsibilities as modified by the new conditions, though in due course many of them will pave the way for the final organisation, which can only be set up when amalgamation details are completed and some experience of unified working has been obtained.

The following lines are included in the respective divisions:—Western—London and North Western (including the late Lancashire and Yorkshire), North Staffordshire, Furness, Cleator and Workington Junction, Dearne Valley, Dundalk, Newry and Greenore, Mold and Denbigh Junction, North and South Western Junction, North London, and Shropshire Union. Midland:—Midland (including Tilbury section), S.M.J., Tottenham and Forest Gate, and Yorkshire Dales. Northern:—all the Scottish companies, and the Belfast and Northern Counties (Mr. J. Pepper, Manager and Secretary), in Ireland.

II.—London and North Eastern.

All except "subsidiary" amalgamations and final procedure are virtually completed, and this railway has been operated as a single concern since January 1, 1923, except that the Hull and Barnsley was amalgamated with the North Eastern Railway from April 1, 1922.

Constituent Companies.—North Eastern, 1,757¾ miles; Great Central, 852⅛ miles; Great Eastern, 1,191¼ miles; Great Northern, 1,051¼ miles; Hull and Barnsley, 106½ miles;

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Photo.] MR. J. CALDER. [*Elliott & Fry.*

General Manager, Scottish Area, London and North Eastern Railway.
General Manager, North British Railway, 1918-1922.

North British, 1,378 miles; Great North of Scotland, 334½ miles.

Subsidiary Companies.—(*a*) *Independently operated lines*: Colne Valley and Halstead, 19 miles; East and West Yorkshire Union, 9¼ miles; Mid-Suffolk Light, 19½ miles. (*b*) *Non-Working Companies*: (1) Originally leased to or worked by the North Eastern Railway: Brackenhill Light; Forcett, 5½ miles; Great North of England, Clarence and Hartlepool Junction, 6¾ miles. (2) Originally leased to or worked by the Great Central Railway: Humber Commercial Railway and Dock; Mansfield, 10 miles; North Lindsey Light, 12 miles; Seaforth and Sefton Junction; Sheffield District, 4¼ miles. (3) Originally leased to or worked by the Great Eastern Railway: London and Blackwall, 6 miles. (4) Originally leased to or worked by the Great Northern Railway: East Lincolnshire Railway, 47½ miles; Horncastle, 7½ miles; Nottingham and Grantham Railway and Canal, 23 miles; Nottingham Suburban, 4 miles; Stamford and Essendine, 12½ miles. (5) Originally leased to or worked by the North British Railway: Edinburgh and Bathgate, 10¼ miles; Forth and Clyde Junction, 30½ miles; Gifford and Garvald, 9¼ miles; Kilsyth and Bonnybridge, 8½ miles, worked jointly with Caledonian Railway; Lauder Light, 10¼ miles; Newburgh and North Fife, 13¼ miles. (6) Originally leased to or worked by the Hull and Barnsley Railway: South Yorkshire Junction, 11½ miles. (7) Originally leased to or worked by several constituent companies: Nottingham Joint Station Committee; West Riding Railway Committee, 32½ miles.

Joint Railways (total mileages stated, shares thereof included above).—(*a*) *Now comprised wholly in the London and North Eastern Railway*: Great Northern and Great Eastern Joint, 123 miles; Hull and Barnsley and Great Central, 25¾ miles. (*b*) *Joint with London Midland and Scottish Railway*: Axholme Joint, 27¾ miles; Cheshire Lines Committee (two-thirds share), 142 miles; Dumbarton and Balloch (including Loch Lomond steamers), 7 miles; Dundee and Arbroath (including Carmyllie Light Railway), 23 miles; Great Central and Midland Joint, 40¼ miles; Great Central Hull and Barnsley and Midland Joint (two-thirds share), 4 miles; Great Central and North Staffordshire Joint, 11 miles; Great Northern and London and North Western, 45 miles; Halifax and Ovenden, 2½ miles; Halifax High Level, 3 miles; Manchester, South Junction and Altrincham, 9½ miles, really a joint working arrangement; Methley (two-thirds share), 6 miles; Midland and Great Northern Joint, 183¼ miles; Norfolk and Suffolk Joint Committee, 22¼ miles (Great Eastern, and Midland and Great Northern Joint); Oldham, Ashton and

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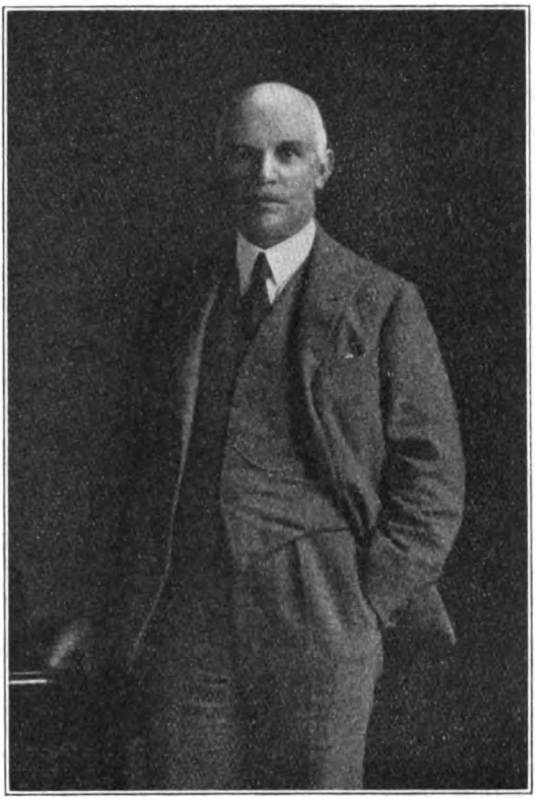
Guide Bridge, 6¼ miles; Otley and Ilkley, 6¼ miles; Perth General Station Committee (one-third share); Prince's Dock, Glasgow (one-third share), 1¼ miles; South Yorkshire Joint (three-fifths share), 20½ miles; Swinton and Knottingley, 19½ miles; Tottenham and Hampstead, 4¾ miles. (*c*) *Joint with Great Western Railway*: Great Western and Great Central Joint, 41 miles. (*d*) *Jointly leased or worked with several railways*: East London (one-sixth share with Southern, three-sixths share, and Metropolitan and Metropolitan District), 5 miles.

Principal statistics are:—Route mileage, 6,590; track mileage (including sidings), 17,500; tender locomotives, 4,900; tank engines, 2,800; coaching vehicles, 20,000; freight vehicles, 297,000; service vehicles, 16,500; electric rolling-stock, 140; and electric locomotives, 13; rail motor cars, 10. Also 6 turbine and 16 other large steamers, 36 other steamers and a number of river boats, lake steamers, motor boats, &c; 295 miles of canals; docks, harbours, &c., at Alloa, Bo'ness, Charlestown, Connah's Quay, Grimsby, Harwich, Hull, Hartlepool and West Hartlepool, Immingham, London, Lowestoft, Methil, Middlesbrough, New Holland, Silloth, South Shields, Sunderland and Tayport; and wharves, staiths, &c., at Blyth, Boston, Chatteris, Gainsborough, Holme, Hull, Keadby, Lincoln, Misterton, Percy Main, Surfleet, Wakefield, Winteringham Haven, and London (Limehouse, Marylebone, &c.); piers at Craigendoran, Mallaig, North and South Queensferry, Tayport, &c.; and 23 modern hotels.



MR. ALEXANDER WILSON, O.B.E.,

Divisional General Manager, North Eastern Area, London and North Eastern Railway.

The new directorate is composed as follows:—Chairman, Mr. W. Whitelaw (N.B.R.); Deputy Chairman, Rt. Hon. Lord Faringdon (G.C.R.); Appointed by the North Eastern Railway: Rt. Hon. Lord Joicey; Sir Hugh Bell, Bart, C.B.; Rt. Hon. Viscount Grey of Fallodon, K.G.; Mr. J. H. B. Noble; Sir Arthur F. Pease, Bart; Mr. O. Sanderson; Col. C. W. Trotter (from the Hull and Barnsley Railway); and Messrs. M. J. Wilson, M.P., and W. K. Whigham. From the Great Northern Railway: Hon. Rupert E. Beckett; Mr. O. R. H. Bury; Lieut.-Col. B. A. Firth; and Mr. F. L. Steel. From the Great Central Railway: in addition to Lord Faringdon, Messrs. W. B. Gair and E. A. Beazley, and the Hon. E. B. Butler-Henderson. Appointed by the Great Eastern Railway: Rt. Hon. Lord Ailwyn, P.C., K.C.V.O., K.B.E.; Col. W. J. Galloway; Sir Eric Hambro; and Mr. H. T. Bailey. Appointed by the North British Railway: in addition to Mr. Whitelaw, Messrs. A. R. Gray and A. K. McCosh; and Lieut.-Col. Hon. A. C. Murray, C.M.G., D.S.O., M.P. Appointed by the Great North of Scotland Railway: Mr. A. Duffus. The total directorate provided for is 28, so that there are two vacancies at present.

So far, although the London and North Eastern Railway is definitely operated as such, only certain chief appointments have yet been announced. Marylebone station has been selected as the head-

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Photo.] [*Elliott & Fry.*

MR. G. F. THURSTON,

Joint Secretary,
London and North Eastern Railway.

Photo.] [*Lafayette.*

MR. J. McLAREN,

Joint Secretary,
London and North Eastern Railway.

Photo.] [*Collins.*

MR. J. A. CAMPBELL,

Registrar,
London and North Eastern Railway.

MR. R. BELL, C.B.E.,

Assistant General Manager,
London and North Eastern Railway.

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quarters, departments being located in the late chief office buildings.

Mr. R. L. Wedgwood, late General Manager of the North Eastern Railway, is Chief General Manager, with Mr. R. Bell (N.E.R.) as Assistant General Manager, and Mr. K. Kerr (N.E.R.) Assistant General Manager (Staff). Mr. J. Calder, General Manager, North British Railway, is General Manager (Scottish Area). The English lines come under the immediate supervision of Mr. A. Wilson (N.E.R.), Divisional General Manager (North Eastern Area), and Mr. S. A. Parnwell (G.E.R.) is Divisional General Manager (Southern Area). On the traffic side, Mr. W. Clow (G.C.R.) is Superintendent (Southern Area), and Mr. C. J. Selway (G.N.R.), Passenger Manager (Southern Area), and we gather that Mr. C. H. Stemp (N.B.R.) is Superintendent of the Southern Scottish Area and Mr. W. Johnston (G.N.S.R.), Superintendent of the Northern Scottish Area.

Two Joint Secretaries have been appointed, Mr. J. McLaren (N.B.R.) and Mr. G. F. Thurston (G.E.R.), while Mr. J. A. Campbell (G.C.R.), is Registrar. Mr. C. L. Edwards (G.N.R.) has been appointed Chief Accountant. Sir Francis Dunnell, (N.E.R.) is Chief Legal Adviser; Mr. T. Chew (G.E.R.) is Solicitor (particular Legal Work); Mr. G. Davidson, late General Manager and Solicitor (G.N.S.R.), Solicitor (Scottish). Mr. H. R. Cripps, from the Ministry of Transport, is Chief Assistant Solicitor.

MR. KENELM KERR, O.B.E.,

Assistant General Manager (Staff), London and North Eastern Railway.

III.—The Great Western Railway.

Except for certain steps, the formation of the new Great Western Railway, the only name from the past which is continued, is practically completed.

Constituent Companies.—Great Western, 3,005 miles; Barry, 68 miles; Cambrian, 295¼ miles; Cardiff, 11¾ miles; Rhymney, 51 miles; Taff Vale, 124½ miles; Alexandra (Newport and South Wales) Docks and Railway, 10¼ miles.

Subsidiary Companies.—(*a*) *Independently worked*: Brecon and Merthyr Tydfil Junction, 59¾ miles; Burry Port and Gwendreath Valley, 21 miles; Cleobury, Mortimer and Ditton Priors, 12 miles; Llanelly and Mynydd Mawr, 13 miles; Midland and South Western Junction, 63¼ miles; Neath and Brecon, 40 miles. (*b*) *Semi-Independent lines*: Worked by Great Western Railway but possessing separate rolling-stock, &c.: Port Talbot Railway and Docks, 35 miles; Rhondda and Swansea Bay, 29 miles. (*c*) *Non-Working Companies*: (1) Originally leased to or worked by the Great Western Railway: Didcot, Newbury and Southampton, 42¾ miles; Exeter, 8¾ miles; Forest of Dean Central, 5 miles; Gwendreath Valley, 3 miles; Lampeter, Aberayron and New Quay Light, 12 miles; Liskeard and Looe, 9 miles; Princetown, 10½ miles; Ross and Monmouth, 12½ miles; Teign Valley, 7¾ miles; West Somerset, 14½ miles. (2) Originally leased to or worked by the Taff Vale Railway: Penarth Extension, 1¼ miles; Penarth Harbour, Dock and Railway, 9¼ miles. (3) Originally leased to or worked by the Cambrian Railways: Mawddwy, 6¾ miles; Van, 6¾ miles; Welshpool and Llanfair Light, 9¼ miles; Wrexham and Ellesmere, 12¾ miles. (4) Originally leased to or worked by the Port Talbot Railway and Docks: South Wales Mineral, 13 miles. (5) Originally leased to or worked by the Barry Railway: Vale of Glamorgan, 20¾ miles.

Joint Railways (total mileages stated, shares thereof included above).—(*a*) *Now comprised wholly in the Great Western Railway*: Quaker's Yard and Merthyr, 6 miles; Taff Bargoed, 11 miles. (*b*) *Jointly with London Midland and Scottish Railway*: Birkenhead 56½ miles; Brecon and Merthyr and London and North Western Joint, 6 miles; Brynmawr and Western Valleys, 1¼ miles; Clee Hill,

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Photo.] [*Elliott & Fry.*

MR. W. CLOW, C.B.E.,
Superintendent, Southern Area,
London and North Eastern Railway.

Photo.] [*Elliott & Fry.*

MR. C. LEWIS EDWARDS, C.B.E.,
Chief Accountant,
London and North Eastern Railway.

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6 miles; Clifton Extension, 9 miles; Great Western and Great Central, 41 miles; Halesowen, 6 miles; Nantybwch and Rhymney, 3 miles; Severn and Wye, 39 miles; Shrewsbury and Hereford, 82¾ miles; Tenbury, 5 miles; West London, 2¼ miles; Wrexham and Minera, 3 miles. (*c*) *Jointly with London Midland and Scottish and Southern Railways*: West London Extension, 5¼ miles, quarter share. (*d*) *Jointly with Southern Railway*: Easton and Church Hope, 3½ miles; Weymouth and Portland, 5½ miles. (*e*) *Jointly with Metropolitan Railway*: Hammersmith and City, 3 miles. (*f*) *Jointly with Great Southern and Western Railway (Ireland)*: Fishguard and Rosslare Railways and Harbours, 107 miles.

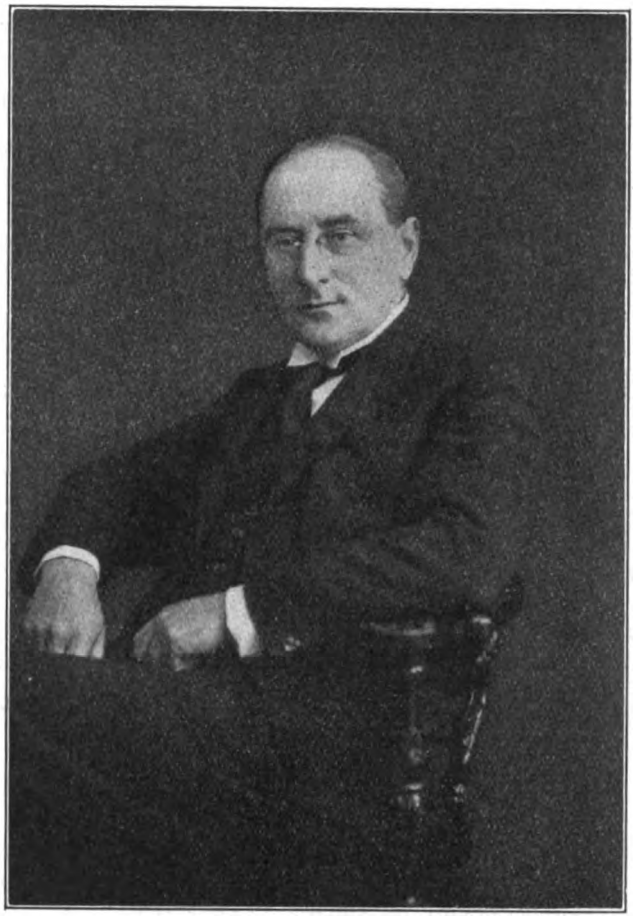

Photo.] [*Elliott & Fry.*

MR. C. J. SELWAY, C.B.E.,

Passenger Manager, Southern Area, London and North Eastern Railway.

Principal statistics consequent upon the grouping are: route mileage, 3,800; track mileage (including sidings), 8,750; tender locomotives, 1550; tank engines, 2,500; coaching vehicles, 10,100; freight vehicles, 90,000; service vehicles, 9,700; electric vehicles, 60; rail motor cars, 70. The Great Western Railway also owns 213 miles of canals; 16 turbine and twin-screw steamers, besides several smaller vessels; docks, harbours, &c., at Barry, Cardiff, Fishguard, Newport, Penarth, Plymouth, Port Talbot, and other places; and ten modern hotels, mostly of large size.

The directorate (25), consists of the following gentlemen:—From the Great Western Railway: Rt. Hon. Viscount Churchill, G.C.V.O. (Chairman); Sir S. Ernest Palmer, Bart. (Deputy-Chairman); Hon. Lord Barrymore; Messrs. F. Bibby, C.B.E., and T. R. Bolitho; Sir A. Brocklebank, Bart; F. W. Grierson, J.P.; Rt. Hon. Lord Inchcape, G.C.M.G., K.C.S.I., K.C.I.E.; Mr. J. F. Mason; Rt. Hon. F. B. Mildmay; Mr. C. Mortimer; Sir H. B. Robertson; J. Shaw, K.C. (also Alexandra Docks); Mr. G. A. Wills; Rt. Hon. J. W. Wilson, M.P., Sir W. W. Watkins-Wynn, Bart, C.B., and Lieut.-Col. Sir H. A. Yorke, C.B. (also Alexandra Docks). From the Barry Railway: Rt. Hon. the Earl of Plymouth, P.C. From the Cambrian Railways: Lieut.-Col. David Davies, M.P. (also Barry Railway). From the Cardiff Railway: Lord Glanely (also Rhymney Railway). From the Rhymney Railway: Mr. W. Heward Bell. From the Taff Vale Railway: Mr. G. Birkley Forrester. From the Alexandra (Newport and South Wales) Docks and Railway: Sir H. Mather-Jackson, Bart, C.B.E. (also Rhymney Railway).

Most of the new appointments have already been set forth in the RAILWAY MAGAZINE, as they were made on various

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dates during 1922, and no important changes have now to be recorded. As regards the chief officers, considering only those coming from the railways brought into the Great Western, Mr. J. H. Vickery, General Manager, Alexandra Company, is now Chief Docks Manager, Great Western Railway, and among the officers from the Welsh systems now holding positions in that department are Messrs. C. S. Page (Cardiff), W. G. Phillips (Alexandra Docks), F. Brown (Alexandra Docks), W. Cleaver (Port Talbot), and M. C. Harrison (Barry Railway). Mr. W. Waddell, General Manager, Barry Railway, has become Docks Assistant to the Chief Engineer, Great Western Railway, and Mr. J. Auld, Mechanical Engineer, Barry Railway, Docks Assistant to the Chief Mechanical Engineer, Great Western Railway.

On the operating side, in the newly-formed Cardiff Valleys Division, Mr. E. H. Dannatt (Taff Vale) is Divisional Superintendent, Mr. C. T. H. Riches (Rhymney) Divisional Locomotive Superintendent; and Mr. P. A. Collins (Taff Vale), District Goods Manager. Similarly, Mr. H. Warwick (Cambrian), is now District Traffic Manager, Central Wales Division, with headquarters at Oswestry.

IV.—The Southern Railway.

This company, which takes over the railways of the Southern group, includes the following "Constituent" companies (route mileages before grouping, including leased and worked, and shares of joint lines as stated) :—

Constituent Companies.—London and South Western, 1,020½ miles; London, Brighton and South Coast, 457¼ miles; London, Chatham and Dover; South Eastern; South Eastern and Chatham Railways' Managing Committee, 637¾ miles.

Subsidiary Companies.—(*a*) *Independently operated lines*: Freshwater, Yarmouth and Newport (Isle of Wight), 12 miles; Isle of Wight, 15¼ miles; Isle of Wight Central, 28½ miles. Also the Bere Alston and Callington section (9¾ miles) of the Plymouth, Devonport and South Western Junction Railway. (*b*) *Non-Working Companies*: (1) Originally leased to or worked by the London and South Western Railway: Bridgewater, 7¼ miles; Lee-on-the-Solent, 3 miles; North Cornwall, 52½ miles; Plymouth and Dartmoor, portion used by London and South Western Railway, 2¼ miles; Plymouth, Devonport and South Western Junction Railway (except Bere Alston and Callington section, see above), 19½ miles; Sidmouth, 8¼ miles. (2) Originally leased to or worked by the London, Brighton and South Coast Railway: Brighton and Dyke, 4¾ miles; Hayling, 5 miles. Also the Victoria Station and Pimlico, the Great Western and London and North Western Railways also being parties to the lease or working arrangement. (3) Originally leased to or worked by the South Eastern or London, Chatham and Dover Railways: London and Greenwich, 3¾ miles; Mid-Kent (Bromley to St. Mary Cray), 2½ miles.

In addition, the Lynton and Barnstaple Railway, though not covered by the Railways Act, 1921, has been absorbed by the London and South Western Railway, and therefore forms part of the Southern Railway. Length is 19¼ miles.

Joint Railways (total mileages stated, shares thereof included above).—(*a*) *Now comprised wholly in the Southern Railway*: Croydon and Oxted, 12½ miles; Dover and Deal, 8½ miles; Epsom and Leatherhead, 3¾ miles; Portsmouth and Ryde, 8½ miles; Tooting, Merton and Wimbledon, 5¾ miles; Woodside and South Croydon, 2½ miles. (*b*) *In association with other companies*: East London, 5 miles, three shares with London and North Eastern, Metropolitan and Metropolitan District one share each; Easton and Church Hope, 3½ miles, jointly with Great Western; Somerset and Dorset, 105 miles, jointly with London Midland and Scottish; West London Extension, 5¼ miles, 2 shares with Great Western and London Midland and Scottish, 1 share each; Weymouth and Portland, 5½ miles, jointly with Great Western.

Combined mileage and rolling-stock of the new system is as follows:—Route mileage, 2,200; track mileage, including sidings, 5,400; tender locomotives, 1,240; tank engines, 1,150; coaching vehicles, 10,800; freight vehicles, 37,500; service vehicles, 2,280; electric vehicles, 460; rail motor cars, 14. The new company owns 38 large turbine or other steamers, and a number of smaller vessels; 3½ miles of canals; docks, harbours, &c., at Southampton, Newhaven, Plymouth, Littlehampton, Folkestone, Dover, Whitstable, Strood, Rye, Queenborough, Port Victoria, &c.; and 10 large and well-known hotels.

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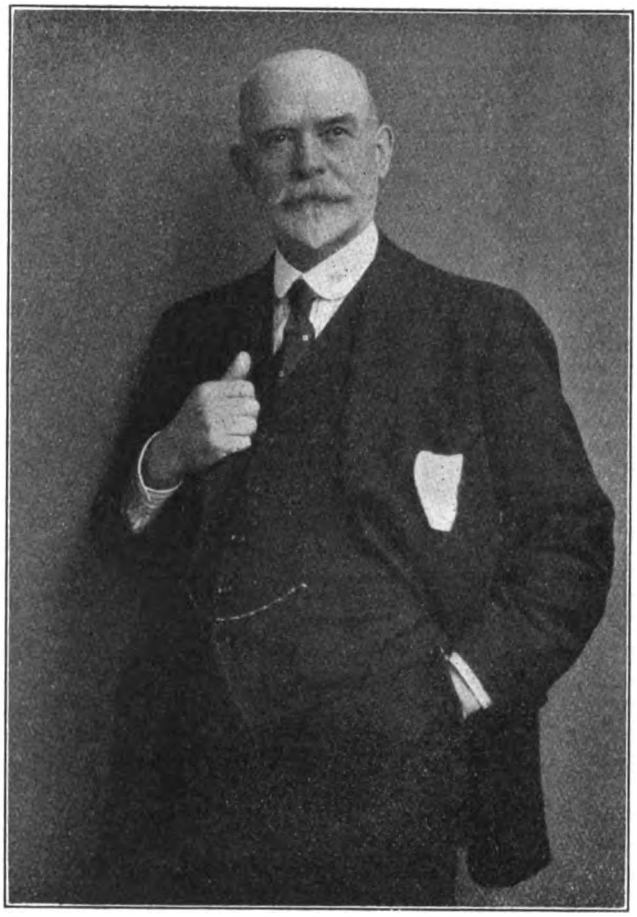
So far no announcement as to the chief officers and the new organisation has been made, except that Mr. J. J. Brewer is Secretary and Mr. W. Bishop, Solicitor, while, for the time being, the three chief component railways will continue to be managed as heretofore. The new directors (21), as appointed by the "constituent" companies are: From the London and South Western Railway, Sir Hugh Drummond, Bart, C.M.G.; Rt. Hon. Sir Evelyn Cecil, G.B.E., M.P.; Rt. Hon. Lord Clinton; Mr. R. Holland-Martin, C.B.; Rt. Hon. Sir George H. Murray, G.C.B., G.C.V.O.; Sir Charles Owens, C.B.; Sir Owen Philipps, G.C.M.G.; Rt. Hon. Viscount Pirrie, K.P. From the London, Brighton and South Coast Railway: Messrs. F. DudleyDocker, C.B., Gerald W. E. Loder and C. J. Lucas; Sir C. L. Morgan, C.B.E.; and Sir Robert Turnbull, M.V.O. From the South Eastern Railway: Brig.-Gen. the Hon. Everard Baring, C.V.O.; Messrs. E. W. Mellor and W. Mewburn; Sir D. L. Salomans, Bart.; and Mr. C. Sheath. From the London, Chatham and Dover Railway: Sir Vincent Caillard; Sir Francis Dent, C.V.O.; Sir George Younger, Bart.



MR. DAVID COOPER, J.P.,
General Manager,
Glasgow & South Western Railway, 1894-1922.

Far-reaching changes such as those indicated naturally involve a great many retirements, though to some extent these are really nominal for the time being, quite a number of chief officers who have officially retired being still actually in office, to cover the problems of the transition period and "handing over." Others will probably retire when further progress is made with the final organisations, certain appointments above set forth being admittedly of an interim nature.

One of the most interesting personalities who now relinquish the reins of office is Mr. David Cooper, General Manager of the Glasgow and South Western Railway for the long period of 25 years, completing 55 years of railway service. The Glasgow and South Western Railway first assumed its title in 1851, on the amalgamation of several constituent companies, so that Mr. Cooper's connection with the company has lasted through 55 of the 71 years of its existence. He began life as a parcels clerk at the little country station of his native place, Waterside, Ayrshire. Two years apprenticeship at Waterside was followed by three years of further experience at Maybole, and we find him transferred in 1872 to the Office of the Superintendent of the Line at the old Bridge Street terminus—four years before St. Enoch was opened. During the 12 years that

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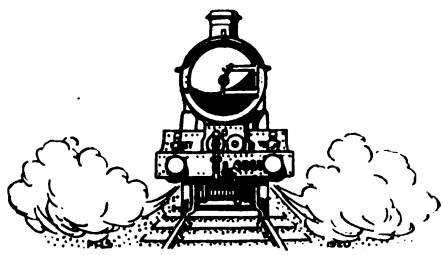
followed, and the succeeding five as chief assistant to the General Manager, he gave such signal tokens of administrative ability, initiative, and thorough grasp of detail, that his appointment in 1889 as Superintendent of the Line was inevitable. Five years later, at the early age of 39, he became General Manager. The last three decades have seen much labour unrest; the comparative quietness on the Glasgow and South Western Railway has been due, in no small degree, to the tact and understanding of a manager who himself rose from the ranks. During the war, Mr. Cooper held the rank of Lieutenant-Colonel, Railway Engineers and Staff Corps, and had the honour of being presented to His Majesty the King. Mr. Cooper has been Chairman of the Superintendents' and General Managers' Conferences of the Railway Clearing House. He is a Justice of the Peace of the County of Glasgow and of the County of Renfrew.

SIR SAM FAY, General Manager, Great Central Railway, was born at Southampton in 1856, and commenced his railway career as a junior clerk in the Traffic Department of the London and South Western Railway in 1872. In 1884 he was removed to the Traffic Superintendent's Office at Waterloo as second clerk, and ten months later appointed chief clerk to the Superintendent of the Line, remaining in this position till 1891, when he was appointed Assistant Storekeeper. In 1892 he left the London and South Western Railway to be General Manager of the Midland and South Western Junction Railway. This position he held until his return to the London and South Western Railway as Superintendent of the Line in April, 1899. In March, 1902, he became General Manager of the Great Central Railway. He was elected Chairman of the General Managers' Conference of the Railway Clearing House for 1911. On the occasion of the opening of Immingham Docks by His Majesty the King in July, 1912, a knighthood was conferred in recognition of his services. Early in 1917, Sir Sam Fay was appointed to the control of military and munition movements in Great Britain in connection with the Department of Military Railways. In March, 1918, he was made Director-General of Movements and Railways, with a seat on the Army Council.

MR. FRANK TATLOW, C.B.E., General Manager, Midland Railway, was for many years Principal Assistant to the General Manager, Midland Railway. Mr. Tatlow was appointed during the latter months of 1915 to a new position as Assistant General Manager. On the retirement of Sir Guy Granet at the end of 1918, Mr. Tatlow was appointed General Manager. Mr. Tatlow was associated with the General Manager's Department from the time when he entered the Company's service as a boy. He has the distinction of having been personally connected with every General Manager the Midland Railway has had—Sir James Allport, Mr. John Noble, Mr. G. H. Turner, Mr. John Mathieson, and Sir Guy Granet.



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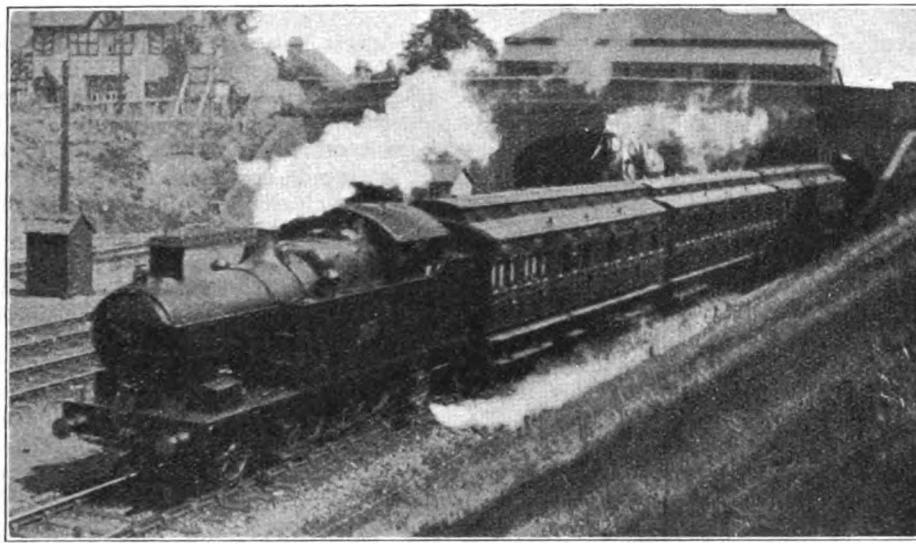

Photo.] GREAT WESTERN RAILWAY. [*O. S. Nock.*

Birmingham district suburban train leaving Acock's Green. 2–4–2 tank engine No. 3608.

The Suburban Traffic Problem.

By J. F. GAIRNS.

MORE than half of the business men and women of the British Isles, and at least one-third of the manual workers, now travel by train to and from the scenes of their daily labours. It is, indeed, exceptional in large towns to find that more than a proportion of the workers can reside within easy walking distance of office, shop or works, with the result that in all the great cities the daily journeys made by season, zone or workmen's ticket holders provide the railways concerned with traffic of a reasonably valuable character, and the dimensions and volume of which place a considerable tax upon their operating material and resources. Add to this the journeys made by school children, by private people, and the families of business men, entailed by residence in the suburbs or outskirts of a large town and therefore removed from the central areas, and the result is a big traffic, usually of a complex nature, which involves many difficulties, besides serious responsibilities, upon the railway companies which carry it. In many instances there is often a considerable amount of long-distance season-ticket travel; but this is associated with the main line work, except that the trains have to be dealt with at the same times as the true suburban traffic. It may, however, be disregarded for present purposes, suburban traffic being understood to be that due to the inner and outer residential districts which surround most of the large cities.

This traffic may be classified thus :—

(1) Early morning and workmen's traffic into town.

(2) Morning rush of season-ticket and other regular traffic arriving after 8.0 a.m.

(3) Evening or Saturday afternoon pressure, which may combine both (1) and (2) in the homeward direction.

(4) Intervening light-traffic periods.

(5) Late evening facilities.

(6) Sunday services.

In some respects the morning services are the more easily dealt with, as the traffic is largely standardised, the workmen's traffic is separated from most of the season-ticket traffic, trains are picking up passengers on a distributed basis, and the pressure is spread over a longer period than in the other direction. It is possible, therefore, to adapt the train services between 6–7, 7–8, 8–9 and 9–10 a.m. to the varying pressure of the traffic, for which reason the morning services often

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present distinctly different features from those of the return period. Indeed, it is fairly correct to suggest that there is no real problem under these circumstances, and the primary necessity is to provide sufficient trains, to distribute these appropriately, to arrange for stopping at or passing the busier stations concerned so as to avoid overcrowding certain trains and underloading others, and to take into account the fact that if the business area is mainly located in the immediate vicinity of the terminus, the largest crowds will assemble for the trains due just before the half hours.

On some railways there are several distributing town stations, and this is often of material assistance, while it affords a means of dividing up traffic by serving only certain alighting stations by each train. It is necessary, however, to consider the needs of intermediate traffic, for many stations which do not produce a great deal of traffic themselves are yet used by many local shopkeepers and their employees, school teachers, scholars, and by workpeople locally employed, who may live in the recognised suburban residential districts.

It is, however, the return pressure which entails the greatest difficulties, particularly since shorter hours of labour have been general and the systematic closing of business establishments at about 1.0 p.m. on Saturdays. Here the problem is most acute, and it is probably incapable of a full solution, in that it is manifestly impossible for any railway to run trains between 1.0 and 2.0 p.m. on Saturdays capable of conveying as much traffic as between 5.0–7.0 p.m. on other days, or which is distributed in the other direction over about three hours, with additions peculiar to Saturday as a half-day holiday and the prelude to week-end arrangements.

Given, however, four or six tracks out of a terminus, a sufficiency of platforms, and approaches designed to avoid as far as possible the delaying effects of arriving upon departing trains and *vice-versa*, much can be done by scientific scheduling of trains. By electric traction the movements of light engines following out or backing on to trains are avoided, but for terminal purposes a certain time at a platform is inevitable, whether trains are steam or electric, and in itself there is not much gain to be had from this cause. Neither is it possible to add very much to track capacity by electrification unless automatic signalling is also installed, the benefit otherwise resulting only from the more rapid acceleration and therefore quicker clearance of sections. With manual signalling electrification enables, perhaps, three or four more trains to be operated on each track per hour, but its full possibilities in this respect cannot be utilised unless automatic signalling is also provided.

Allowing for a headway of three minutes per track, the problem then is to operate 20 trains between, say, 5.0 and 6.0 p.m. on one track, with 20 in the opposite direction, some of which must cross the path of a departing train to reach a terminal platform during a 3-minute departure interval, and with the penalty that any delay in either direction will add to the headway of one train and shorten that of the next and several trains behind it. To operate trains in this way is almost a counsel of perfection, and in practice it is better to regard, say, 15–18 trains per hour on one track as the real limit. There should, however, be periodic longer intervals to allow for the movements of conflicting trains and to enable any delays which may occur to be picked up within two or three trains. Thus, on a 15-train basis, the departure could appropriately be 0, 3, 6, 12, 15, 18, 24 . . . minutes past the hour, the intervening 6-minute interval allowing of any delay being picked up. The 12-minute train could be made semi-fast for three or four stations, its advance headway being thus transferred to the 6-minute period behind it, that at 15 minutes being a slow. Should there be a delay, the 12-minute train may be unable to maintain its fast schedule, but it should at least be able to run without delaying the 15-minute train behind it.

In practice, traffic can rarely be worked quite so exactly, when everything depends upon each train maintaining schedule in every detail, but with the "pull-up" intervals occurring every 10 or 12 minutes this difficulty may be largely overcome, especially if platform entries at the terminus are arranged so that conflicting arrivals are scheduled for the longer intervals. It will be remembered that these principles are maintained in regard

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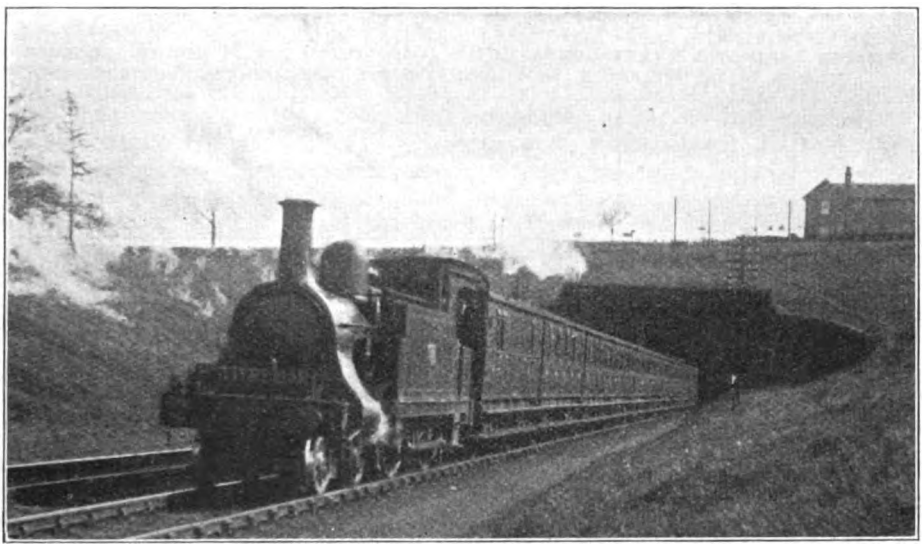
to traffic at platforms 1–4 at Liverpool Street station, London and North Eastern Railway, though unless a certain amount of special signalling equipment is provided and detail improvements made, it is hardly practicable to consider a 0, 2, 4, 6, 10, 12, 14, 16 minute service for present purposes, especially as, in the case mentioned, the successful operation of this sequence is contingent upon the two lines serving four 1¼ miles out. Hence attention is mainly confined to circumstances permitting of a three-minute headway only.

The next aspect is that of distributing the traffic of various stations between trains. Very frequently, however, on a particular suburban route, the busy stations go more or less in pairs, so that the "skip-stop" principle is often applicable, one of two consecutive trains serving one station of each pair and that following the other. The "skip-stop" principle, too, reduces the necessary headway between trains, in that as one train is held back by a stop that in front is getting ahead to allow the first to run through a station in due course. Moreover, the actual headway between the two trains need not be much more than that where all trains call at each station. In fact, there is something to be said for timing them almost on an all-station basis, or with only two or three minutes gain on a complete journey, if a good distribution of passengers is thus secured and schedule times, even if somewhat slow, can be maintained.

On many railways the inner suburban traffic within about four or five miles of the terminus is relatively unimportant, and in some instances this traffic has deliberately been allowed to pass to the tramways and motor omnibuses. When that is the case, the situation is simplified, in that the inner stations do not require much consideration on their own account.



Photo] LONDON, MIDLAND & SCOTTISH RAILWAY. [*K. A. C. R. Nunn.*

Broad-Street–Potters Bar train emerging from Hadley Wood tunnel.
North London Railway 4-4-0 tank engine No. 39.

There is, however, need for considering traffic between these less important stations and the busy ones, and of general intermediate station to station traffic, both of which will not always fit the "skip-stop" arrangements. Pre-supposing that on a route having stations A–K, of which G–K require a good service of business trains, while B–F are inner intermediate but less important stations, then the suggested 0, 3, 6, 12, 15, 18 . . . service might be distributed as on page 108, allowing for slight adjustments and including in some cases two-minute

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intervals between a train passing the first station out and one calling there. This is not altogether essential, and may not be practicable in some circumstances, but is a possibility which can often be realised, especially if outer home signals are provided and the signal sections are reasonably short. The scheme is for a 24-minute series giving six trains for the same route, making 15 for the hour, but including several intervals during which other trains can use the route for three, or perhaps four, stations out, and allowing for intervals where opposite direction trains can cross at one or two junctions. Although designed to give three trains in 11 minutes, to enable passengers from any intermediate station to reach any other intermediate station by not more than one change, the trains are actually arranged in groups of two and four. No. 1 train in the above table is really the last of the previous series, but is included to show how intermediate facilities are provided.

Nos. 2 and 5 are intervals for other trains using part of the route, preferably not stopping intermediately. Disregarding No. 1 for the moment, Nos. 3 and 4 are complete "skip-stop" schedules, the second having one more intermediate stop than the first, thus accounting for one minute increase on its schedule, while the spreading out allowance of 7 minutes between H and J completes the 4 minutes provided in every instance between trains at K. Similar adjustments here and there allow for the anticipated condition, that from G onwards the sections will probably be of fair length and based on a four-minute headway.

No. 6 takes advantage of a 6-minute departure interval, but as it has to co-operate with No. 1 for intermediate facilities, it calls at F to take up intermediate passengers brought by No. 1 or No. 4, then serving all stations.

Being, however, an apparently faster train—passengers tend to select such trains, thus causing them to be overcrowded, leaving trains intended to relieve them half empty—passengers from A are not allowed to use it for F, H and K, the times being only for local purposes. A train such as this is essential if intermediate facilities are to be provided for at all. As shown, a passenger from C to D can use No. 1; from C to G or I, No. 1 to D and No. 4 onwards; from E to F, No. 1; from E to G or I, No. 1 to F and No. 6 onwards; from H to I, No. 6; and similarly for other requirements. Nos. 7 and 8 are similar to Nos. 3 and 4, but reversed, in order to avoid Nos. 8 and 9 both calling at B, and to give to No. 7 calls at F, H and I, which are not given from A by No. 6. No. 9 completes the series, all stations to F, and skip-stop beyond, to distribute its

SUGGESTED "SKIP-STOP" ARRANGEMENT (WITH ADAPTATIONS) FOR 24 MINUTE SEQUENCE OF TRAINS, 6 FOR ONE ROUTE, PROVIDING ALSO FOR INTERMEDIATE REQUIREMENTS.

All Station Times.	—	Busy Period Times.								
		1	2	3	4	5	6	7	8	9
0	A	0	—	7	9	—	15	18	22	24
3	B	3	—	—	12	—	—	21	—	27
6	C	6	—	12	—	—	—	—	27	30
9	D	9	—	—	17	—	—	26	—	33
12	E	12	—	17	—	—	—	—	32	36
16	F	16	—	—	23	—	26*	32	—	40
19	G	—	—	23	—	—	29	—	38	—
23	H	22	—	—	29	—	33†	38	—	46
26	I	—	—	29	—	—	36	—	44	—
30	J	28	—	—	36	—	40†	44	—	52
34	K	32	—	36	40	—	44	48	52	56

* Stop to pick up only. † Does not convey passengers from A to these stations.

NOTE.—A is the main terminal. B—F are inner suburban stations not greatly used for traffic from A, G—K are busy residential stations.

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principal traffic and to avoid delaying the repetition of No. 3 behind it. It will be seen that no attempt is made to give very fast running, though No. 6 is fairly good as far as F, but every train is an improvement on the all-station times, and in no case can passengers from A for all stations G–K occupy the same train. Furthermore, no station has longer than 8 or 9 minutes between trains, and the longest possible loss of time is in changing from No. 1 to No. 6 (certain stations only), while Nos. 1 and 9, which meet light requirements where 3 or 4 or 7 or 8 do not provide for the desired intermediate journey, recur every 24 minutes. It may be pointed out that if any of the stations C, D, E, F or G are junctions, there are intervals where opposite direction trains can cross the path of one of those schedules, if booked accordingly.

Frequently, under circumstances such as those suggested, the heaviest demand will terminate at about I, in which case some trains should not go beyond, or it may be sufficient to serve all stations afterwards. In other instances, there will be a diverging route, as at I, which may be given to one of each pair of " skip-stop " trains, or to those fast to F and all stations beyond, the diversion of one train of the series enabling others to serve all or desired stations on the main route beyond the junction.

When more than one series has to be operated over the same tracks, the full number of trains is necessarily divided between them, and altered allocations of stops may be required; but the point to be emphasised is rather that of systematic and entirely recast train services, utilising all the possibilities of the " skip-stop " principle, and doing away with fast running, except in so far as may be practicable where a longer train interval is given, in order to better the aggregate facilities. In the case of electrified lines the old schedules are usually discontinued altogether; why not adopt the same principle in connection with overburdened steam services, even although it may involve the loss of conventional train schedules and the disappearance of a few favourite fast trains whose necessary headway handicaps other facilities?

These suggestions, incorporating the principal ideas resulting from a study undertaken some years ago, and before any particulars were available of the measures adopted in 1920 by the Great Eastern Railway, are based on quite ordinary conditions, without reference to track improvements, new signalling, or running accelerations and other methods usually considered necessary to afford any material relief to the suburban traffic problem. It is, of course, pre-supposed that goods traffic will be kept out of the way during the hours of pressure, but as set forth there should be opportunity for interpolating an occasional train of another character without seriously altering the arrangements suggested. It is also anticipated that alternative tracks are available for trains on other routes, or that services for varying destinations are combined as far as the junction station, beyond which point it may not be necessary to adopt special schedules as indicated.

Reference to the suburban traffic problem would, however, be incomplete without consideration of the intermediate and late evening facilities, which receive very varied treatment. Still restricting attention to true suburban services, it has always to be remembered that a populous suburban district occasions a wide variety of travel. It may not be great at any one period, apart from the rush hours, but it is spread over the whole of the quieter hours. Even although there may be no real workmen's traffic, there is need for a service into town from quite early hours. Similarly, the theatre traffic is only part of the late evening demand. Therefore, the object should be the giving of reasonably frequent trains throughout the day, though at the same time it is obviously not necessary to run full length trains all the day. At present, the usual ideal of the railway companies is to provide about a half-hourly service, but it may be submitted that this is not enough. A 15-minute, or, at least, a 20-minute service should be aimed at, thus reducing the intervals to a reasonable limit, whereas the 25-minute wait which so often falls to the lot of the middle-day or evening traveller who just misses a train, is most irritating, especially where the journey to be made is of only 6 or 8 miles at most.

A suitable course is to run short trains,

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consisting of sections of standard trains worked by the ordinary engines, to give the 15 or 20-minute service, but only on the main route, the branching routes being operated by corresponding sets running in connection from and to the junction station. These need only run as far as the real suburban area extends, for it is absurd to suggest that more distant stations should be similarly favoured. To provide for through luggage and incidental traffic, it could be arranged that, say, the 0.0 train from the terminus served suburban stations down the main line, with a branch train in connection at F, the 0.15 train being through to the branch, with a main line local connection at F, and so on alternately, or similarly on a 20-minute basis.

If this method were adopted there would be much less ground for the complaints at present rife as to the inadequacy of the slack-hour facilities in the case of populous suburban districts. Some adaptation of the junction station might be necessary where there are no terminal facilities to provide for the running round of engines on the short locals, or a spare engine may be necessary, though this could serve the main and the branch locals alternately. Measures on these lines are, however, vitally necessary if the goodwill of suburban residents is to be maintained in this respect, as well as in regard to the rush-hour arrangements, while the method suggested could largely be operated by engines, rolling-stock and staff whose employment is more or less essential, in some way or another, to meet the conditions of the 8-hour day.

In regard to Sunday trains, the general practice of running regular trains at reasonably frequent intervals should suffice, except that there are cases where the arrangements are not up to this standard and which therefore require attention. If the district is one served well by tramcars and omnibuses, it is obviously not good policy to divert railway passengers thereto because the railway facilities are so much less adequate. Therefore, within the true suburban area there should, at least, be a half-hourly service throughout most if not all of Sunday, unless travel is to be deliberately discouraged on that day as a matter of policy. Here, however, the short local train principle above outlined can be utilised, so that increase of facilities on the separate routes does not involve doubling the number of trains on the sections in common.

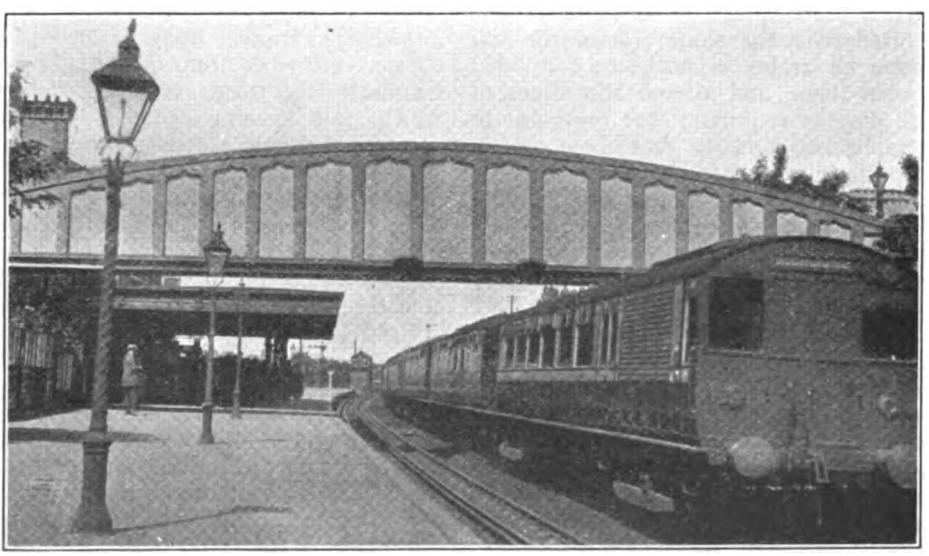

Photo.] [*J. F. Gairns.*

BROAD STREET—RICHMOND 6 COACH ELECTRIC TRAIN AT KEW GARDENS.

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New Sleeping Cars for Calais-Mediterranean Services.

Inauguration of " Blue " trains, including steel sleeping cars of notable design, by the International Sleeping Car and European Express Trains Company.

A NUMBER of steel sleeping cars, including special features of design, and constituting a great improvement upon any vehicles hitherto used for the Calais-Riviera express services, have been constructed by the Leeds Forge Company, Limited, to the order of the International Sleeping Car and European Express Trains Company.

A sufficient number of the 40 cars ordered have now been delivered to enable not only the P. & O. Express, but also the Calais-Mediterranean Express, which runs daily in the winter months, to be made up entirely of these new cars. Each car still takes 16 passengers, but there are eight single-berth compartments, and four compartments containing two berths in each. The cars are 77 ft. in length and weigh about 53 tons. They are further described later.

Five cars, apart from restaurant and baggage cars, comprise a set. A set leaving Calais on a Monday afternoon reaches Vintimille on Tuesday. On its return journey to Calais it leaves Vintimille on the Wednesday and arrives at Calais on the Thursday, leaving on another round trip the following day. It thus requires four sets of five cars each, and six spare cars (making 26 cars in all), to maintain this daily service. As each car cost £12,500, the magnitude of the enterprise of the International Sleeping Car Company in providing these luxurious new vehicles for the Calais-Mediterranean service will be appreciated. In Great Britain, with its short distances, sleeping cars have only to be used as sleeping cars, but on the Continent, and in America, with longer distances, sleeping cars have to be designed so as to be convertible for day and night use. In providing cars, each of which has no less than eight single-berth and four double-berth compartments, the International Sleeping Car Company has greatly added to the comfort of the Calais-Riviera service.

To inaugurate the placing in service of these cars, on the invitation of the Northern of France and Paris, Lyons and Mediterranean Railways, and of the International Sleeping Car and European Express Trains Company, a number of guests recently journeyed from London and Paris to Nice and back. Two special trains were run, one starting from Calais and the other from Paris, on a " voyage d'Inauguration." The guests comprised representatives of French and British railways, the French Government, tourist agencies and of the press.

Representatives of the French Railways included :—Northern of France: M. P. Javary, General Manager (for part of the journey); M. A. E. Moyrand, Traffic Manager; M. Maurice de Waru, Secretary; M. Breville, Chief Mechanical Engineer; M. Rieter, London representative. Paris, Lyons and Mediterranean: M. Margot, General Manager; M. E. Mugniot, Traffic Manager; M. Vallantin, Chief Mechanical Engineer; M. Goy, Secretary; Mr. J. A. de Kerdrelle, London representative. Other French railway officers present included: M. Mange, General Manager, Orleans Railway; M. Riboud, General Manager, Eastern Railway; M. Paul, General Manager, Midi Railway; M. Le Roux, Assistant Manager, State Railways.

Representatives of British railways present included :—Mr. J. Kenneth Foster, Director, Great Eastern Railway Company; Major Ralph Glyn, Director, Caledonian Railway Company; Sir Herbert Walker, General Manager, London & South Western Railway; Sir Sam Fay, General Manager, Great Central Railway; Mr. Kenelm Kerr, Passenger Manager, North Eastern Railway; Mr. W. A. Stanier, Works Assistant to Chief Mechanical Engineer, Great Western Railway; Mr. H. H. Waters, Continental representative, London and North Western Railway; Mr. F. A. Brant, Continental Traffic Manager, and General

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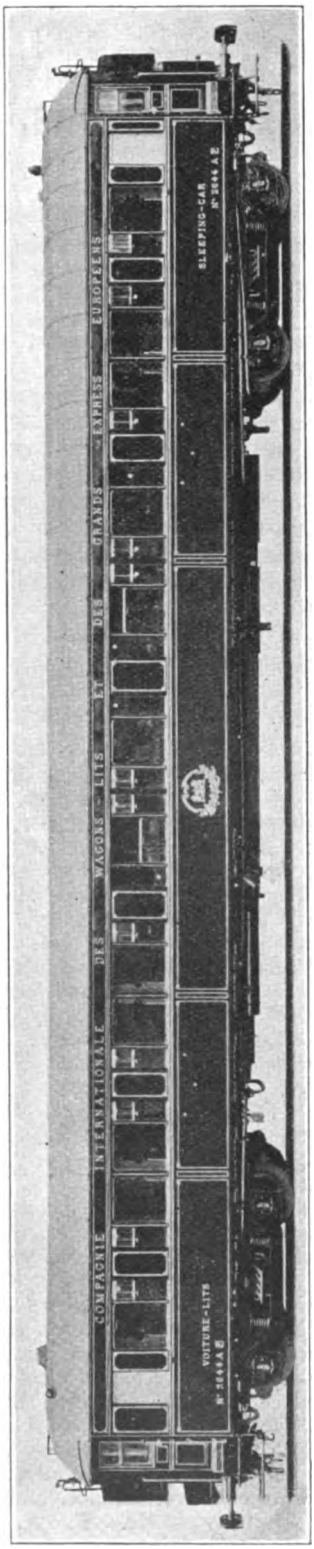

GENERAL VIEW OF NEW SLEEPING CAR FOR CALAIS—MEDITERRANEAN SERVICE.

Hildyard, Paris Agent, South Eastern and Chatham Railway Company. Mr. P. C. Tempest, General Manager, South Eastern and Chatham Railway, travelled with the party as far as Calais, and Mr. H. N. Gresley, Chief Mechanical Engineer, Great Northern Railway, joined the special train at Paris on the return journey.

The International Sleeping Car and European Express Trains Company was represented amongst others by M. Jadot, President; Sir Davison Dalziel, Chairman of Managing Committee; MM. Donegani, Tedeschi, Nagelmackers, Cretenier, Houlder and Baron de Romana, directors; M. Chouffart, General Manager; M. Noblemaire, Traffic Manager; M. H. Doassans, Chief Engineer; Mr. H. M. Snow, London Manager.

Others present included: Sir Philip Nash, Managing Director, and Mr. W. Redpath, Chief Engineer, Leeds Forge Company, Limited; Sir Henry Lunn; Mr. G. E. Howse, General Manager, Thomas Cook & Son; Mr. W. Gourley, London Manager, American Express Company; Mr. Thomas Powell, Manager, Pullman Car Company, Limited; Mr. Clement K. Shorter; General N. Campbell; Mr. J. A. Kay; Mr. J. Barrett Brandreth; Mr. D. M. Sutherland.

The guests starting from London travelled in Pullman cars on the 10.50 a.m. train from Victoria, and on arriving at Calais were welcomed by the delegates of the Northern, P.L.M., and International Sleeping Car Companies. The new sleeping cars and restaurant cars are painted dark blue lined with gold, hence the appellation, the "Blue" train, which has been adopted. The train left Calais at 2.45 p.m., lunch being served immediately on departure. On reaching Paris the train travelled over the Ceinture Railway, arriving at the Paris-Lyons-Mediterranean station about 7 o'clock. Here another special train, also composed of the new cars, was drawn up to accommodate the guests starting from Paris. The two special trains left Paris, P.L.M. station, at 7.25 p.m. and 7.30 p.m. respectively, reaching Nice in glorious sunshine soon after 11 next morning.

H.R.H. The Duke of Connaught, the Crown Prince of Sweden, the Prefect, and the Mayor of Nice, were on the platform to witness the arrival of the new blue trains. M. Margot, General Manager of the Paris-Lyons-Mediterranean, and M. Noblemaire, Traffic Manager of the Inter-

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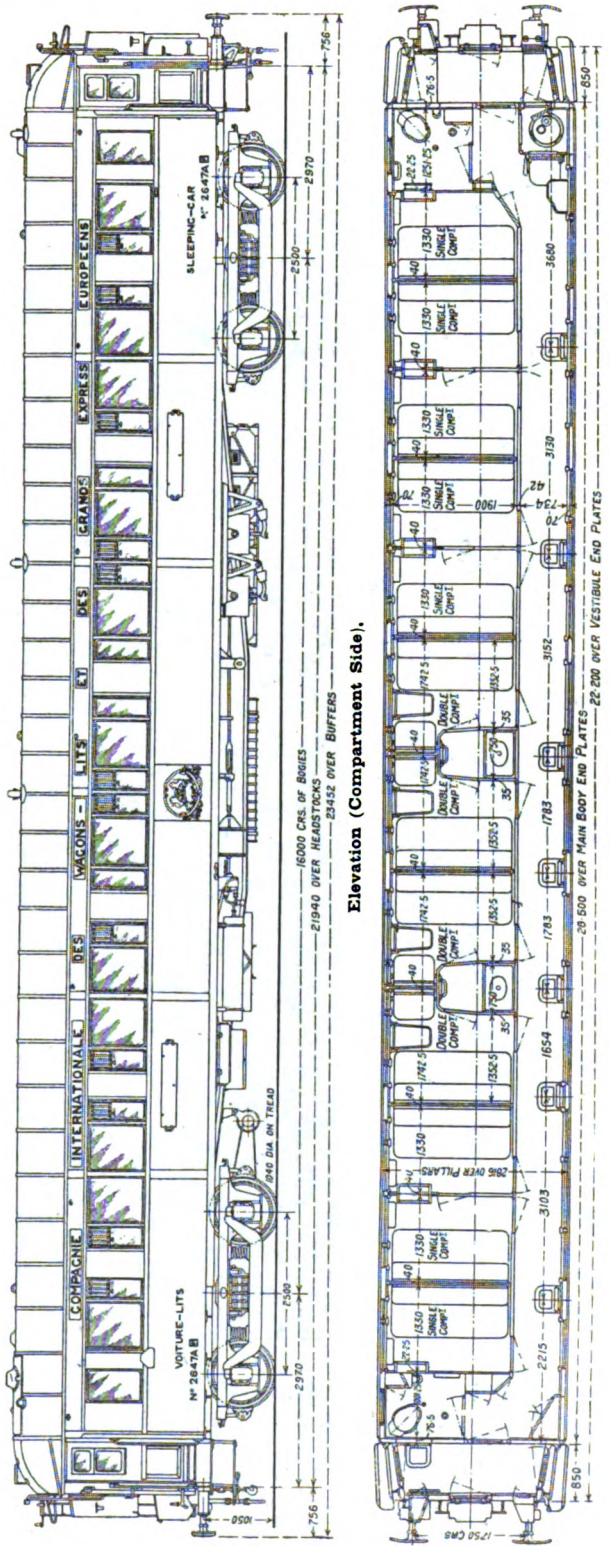
national Sleeping Car Company, alighted and proceeded with the introductions. The Duke of Connaught, the Crown Prince of Sweden, the Prefect and the Mayor then inspected the new trains and the guests were entertained to luncheon at the Hotel Ruhl. The afternoon was devoted to motor drives to Monte Carlo and Mentone and in the evening a dinner was given at the Casino Municipal de Nice, at which M. Margot presided.

In the course of a notable speech, M. Margot, General Manager of the Paris-Lyons-Mediterranean Railway, remarked that "although very severely tried by the war, notably in its German and Russian services, the Compagnie des Wagons-Lits is, by an energetic effort, today giving proof of a greater vitality than it has ever possessed at any moment of its history. It has more cars running than it ever had before; it maintains a service of 11 international *trains de luxe*, one of which alone covers a distance of over 3,000 km.; it has very numerous sleeping car and restaurant car services, and it possesses 60 agencies and over 120 subagencies always prepared to offer their services to the railway systems." He also emphasised the moral significance of developments such as that they were celebrating, all tending to promote Franco-British friendship. "It is because this was our thought that we invited to be present at this inauguration, along with the representatives of the British railways which are in contact with ours, the managers of other British


COMPAGNIE INTERNATIONALE DES WAGONS-LITS ET DES GRANDS EXPRESS EUROPEENS
VOITURE-LITS N° 2647 A B
SLEEPING-CAR N° 2647 A B
16000 CRS. OF BOGIES
21940 OVER HEADSTOCKS
23432 OVER BUFFERS
22200 OVER VESTIBULE END PLATES
20500 OVER MAIN BODY END PLATES
SINGLE COMPT
DOUBLE COMPT

Elevation (Compartment Side).

Floor Plan of Car.

DRAWINGS OF NEW SLEEPING CAR FOR CALAIS—MEDITERRANEAN SERVICE.

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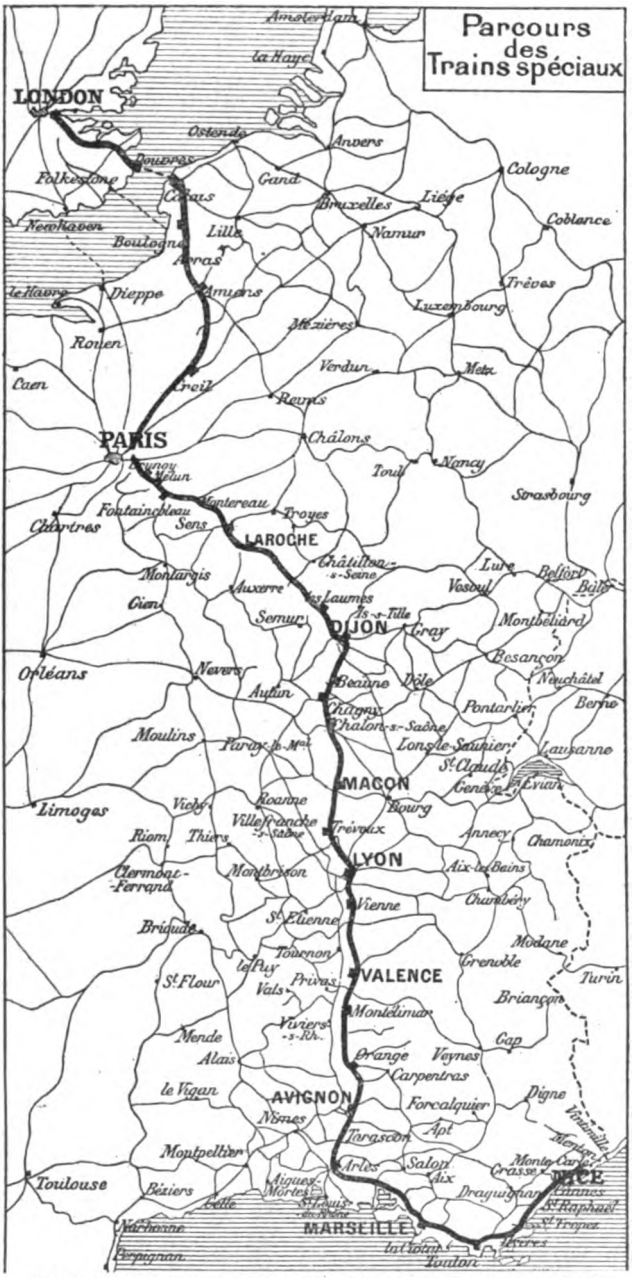

ROUTE FOLLOWED BY THE CALAIS-MEDITERRANEAN EXPRESSES.

railways, and representatives of the British press and their colleagues of the French press."

The following gentlemen were then called upon to speak by M. Margot in the order named: M. Jadot, President of the Board of Directors of the Wagons-Lits; Sir Davison Dalziel, Chairman of the Managing Committee of Directors; M. de Waru, Secretary of the Managing Committee of the Compagnie du Nord; Sir Herbert Walker, General Manager, London and South Western Railway; M. Tedeschi, Director for Italy of the Compagnie de Wagons-Lits, and M. Defert, President of the Touring Club of France.

Sir Davison Dalziel, in bidding welcome to the guests, referred to the gloom in which they had left London on the previous day, and how when they had looked out of the windows of their trains that morning they found brilliant sunshine, blue skies and a blue sea. Personally, he had always looked upon this part of the world as an enchanted country. He hoped that these trains would be the means of bringing many more visitors to the French Riviera, and in conclusion paid a tribute to the Northern of France and Paris – Lyons – Mediterranean Railway Companies, for although the International Sleeping Car Company might build handsome trains they would be useless without the co-operation of the railway companies in transporting them so quickly.

Sir Herbert Walker, responding on behalf of the British visitors, congratulated the International Sleeping Car Company, and the French Railways on their enterprise, stating that the single-berth cars were the one thing wanting to make the service even more popular in the future.

Next day the guests journeyed either by motor cars or by the special trains from Nice to Cannes where luncheon was given at the Municipal Casino. In the afternoon the guests journeyed by motor

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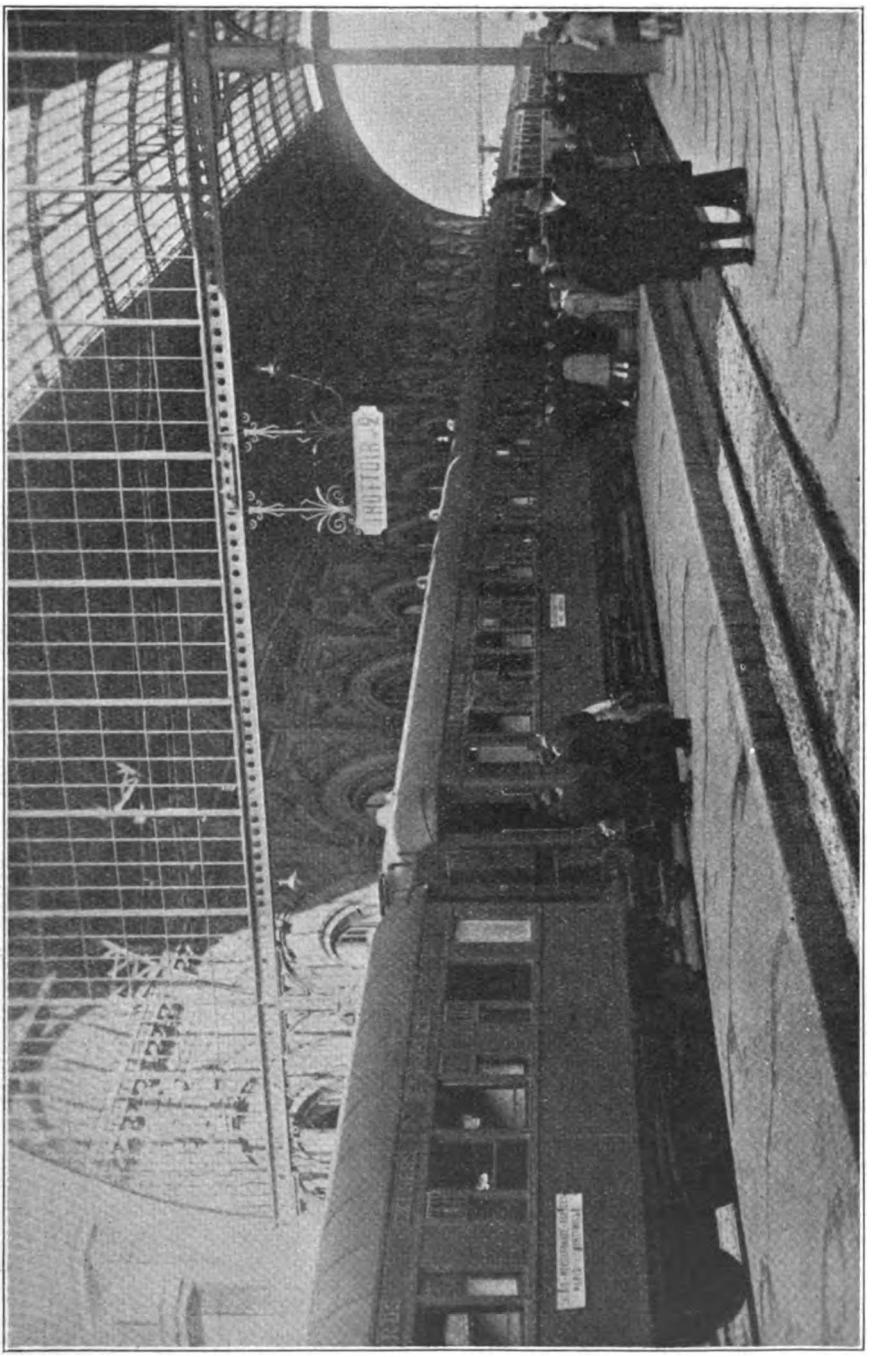

Photo.] ONE OF THE NEW "BLUE" TRAINS, CALAIS—MEDITERRANEAN EXPRESS, AT NICE STATION. [*L'Eclaireur de Nice.*

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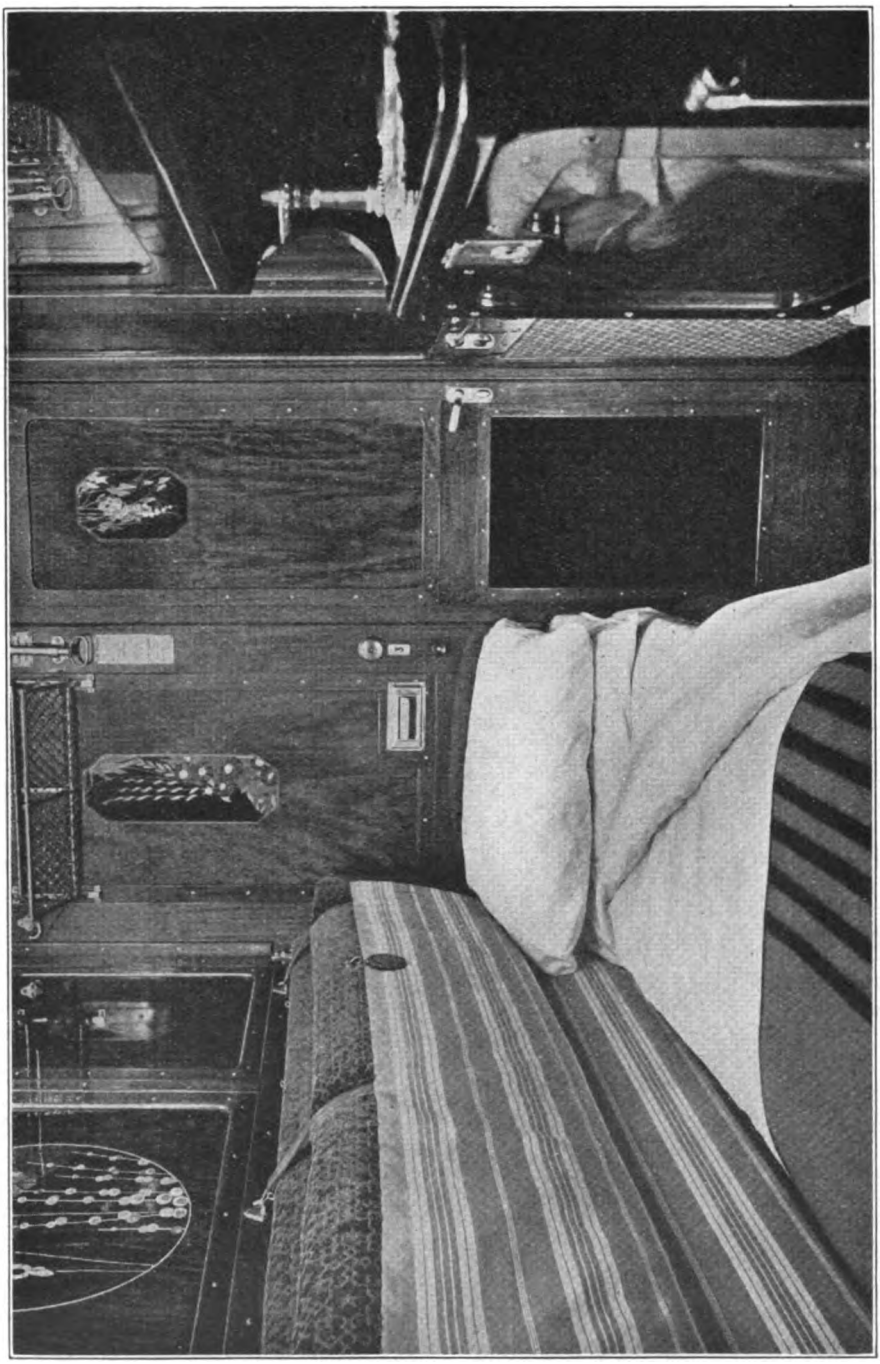

SINGLE-BERTH COMPARTMENT ARRANGED FOR NIGHT USE—LOOKING TOWARDS CORRIDOR DOOR OF CAR.

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cars by the Corniche d'Or to St. Raphael where they joined the return special trains for Paris and Calais respectively.

The new cars have bodies built entirely of steel, constructed in units comprising full length compartment sides, full length corridor sides, body ends, platform ends, full length roofs and canopies, also transverse partitions, thus ensuring complete interchangeability as well as quick production. These units, which for the greater part consist of pressings and rolled sections, all machined to template, are assembled whole on the underframe in a very short time, leaving the shell ready for the assembling of the interior finish. To ensure absence of vibration and drumming, the steel work has been covered on the inside with canvas, and insulation from heat and cold has been well provided for. The whole structure when assembled has been made very rigid by reason of the steel transverse partitions, thus ensuring complete absence of side swaying, the cause of much creaking in the woodwork which is so annoying in a sleeping car.

Each coach has been designed to carry 16 passengers, there being eight one-place compartments, six of which have communicating doors with locks operated from either side, and four two-place compartments. The seats of each compartment turn over to form a berth and the seat-back of the two-place compartment is hinged in order to raise to a horizontal position to form an upper berth; in addition each two-place compartment is provided with a tip-up seat and a table. Every compartment is provided with a wash cabinet, hot and cold water being available, each cabinet having a flap for use as a table with a receptacle below. In the 34 last cars, instead of a wash cabinet, a dressing room is provided for each two-place compartment with locks operated from either side. The one-place compartments have each two windows, to the smaller of which, at the top, is fitted a glass louvre ventilator operated by the passenger, the window dropping only the length of this ventilator. The large window is made to drop to its full length. The two-place compartments have each three windows, two small and one large, one of the smaller being fitted with ventilator as above, the others dropping to their full length. The corridor is provided with tip-up seats and a seat and bed for the conductor, also with straps and handrails, together with a ladder, to enable the windows to be used as a means of exit in the case of an emergency.

At each end of the car is an entrance platform of all steel construction, painted on the interior to match a teak finish, and provided with two side entrance doors, a door to corridor and a door for communication between coaches through a collapsible vestibule. There are two lavatories, one at either end, between platform and compartments, both fitted with toilet requisites, one only being fitted with a wash basin.

The lighting is by dynamo and accumulators on the "Dick" system, each compartment having a triplex light fitting, one lamp of which has a blue globe for use as a night light, whilst each berth has also at its head a reading lamp. There are also suitable lights in the corridor, lavatories, platforms and on the exterior over the platform side doors. The coaches are provided with two heating systems, one being the usual steam heating by radiators controlled by passengers, and the other a hot-water system heated from a boiler fixed in a chamber at one end of the corridor.

A system of signal alarm and a semaphore arrangement for the call bells can be operated from each compartment. The interior is fitted in the usual luxurious style of the Sleeping Car Company, having a mahogany French polished interior finish for compartments and corridor with inlaid panels above waist and figured velvet panels below for compartments, embossed leather panels above waist and plain leather panels below for corridor, the upholstery being in suitable colours to match.

Floors of compartments are covered with layers of cork, felt, linoleum and carpet, the corridor floor being covered with layers of cork, linoleum and carpet. All fittings are of bronze polished and the water tanks, which are made removable through the roof and the piping, are of copper. Cupboards for linen, tools, lamp fittings, wine and utensils, also coal boxes, are provided for in the lay-out, fitted in such a manner that they can be sealed by the Customs authorities on the various frontiers.

The ends of the coaches are so arranged

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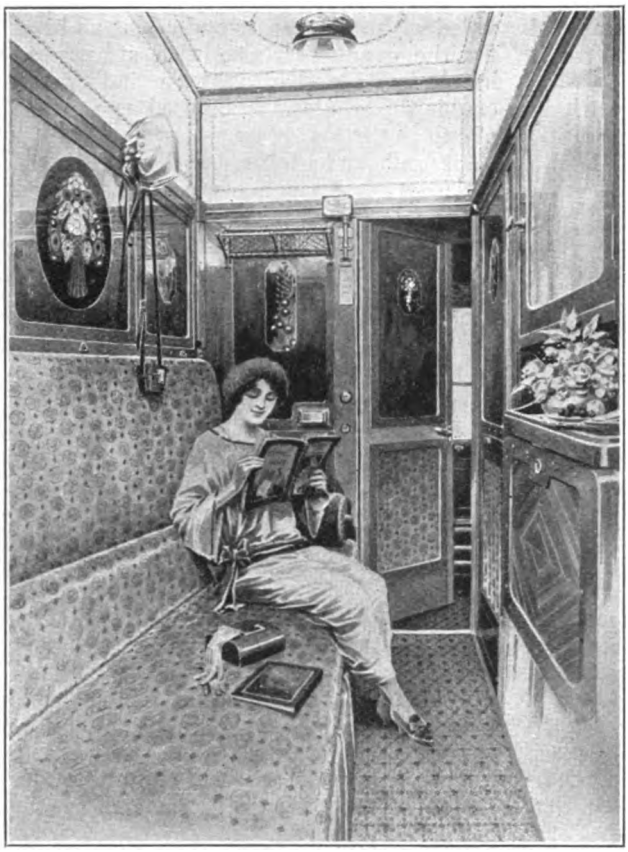

COMPARTMENT ARRANGED FOR DAY SERVICE.

as to enable all the various signal lamps, &c., to be fitted as they pass over the many railway systems of the Continent, the collapsible vestibules also being made to couple up to the many types in use. The exteriors are painted a dark blue and gold lined, as already mentioned, the roof being finished off a dark grey colour. The interior of lavatories and dressing rooms are finished a French grey, below waist being a shade darker than above. Provision has also been made in the body sides to carry away any water finding its way in between the outer and inner skins at the dropping windows.

The underframes consist of a small number of parts, this result being obtained by the use of large steel castings for the ends of the frames. These castings were supplied in a machined condition by the Commonwealth Steel Company, of St. Louis, U.S.A., to the designs of the Leeds Forge Company. Although somewhat similar castings have been used for some time on heavy coaches in America, this is the first occasion on which they have been built into underframes constructed in this country, and it is also the first occasion on which they have been used in conjunction with side buffers. The castings dispense with the very large number of individual parts which would be necessary with the type of buffing and drawgear, &c., adopted for these coaches. Tail pieces extend from the end castings towards the centre of the car in such a manner as to give a thoroughly strong connection with the remainder of the frame. The cast steel construction for the ends of the underframes gives very great resistance in the event of a collision occurring.

As these vehicles run over many railway systems, some of which use vacuum and others compressed air as the source of power, it has been necessary to arrange the brake rigging for use with either system. When the vehicles are in use for the vacuum system, two 24-in. diam. cylinders operate a pair of brake shafts from which the power is transmitted to the brake blocks by suitable rigging, and when the Westinghouse system is in use the power is obtained from a 17-in. diam. cylinder, actuating the same pair of brake shafts through the medium of an intermediate shaft. Further, the vacuum brake is fitted with a converter cock for use on certain sections. The Westinghouse brake is fitted with a double pipe line so that the system may be either automatic or controlled. The same brake rigging can be operated by hand from a wheel placed in the vestibule at one end of each car.

Bolster and spring planks are of cast steel, having been manufactured, together with the bogie frames, by the Commonwealth Steel Company. The bogies are of the equalising beam type, designed with a view to obtaining the easiest possible riding of the cars, and the trials have

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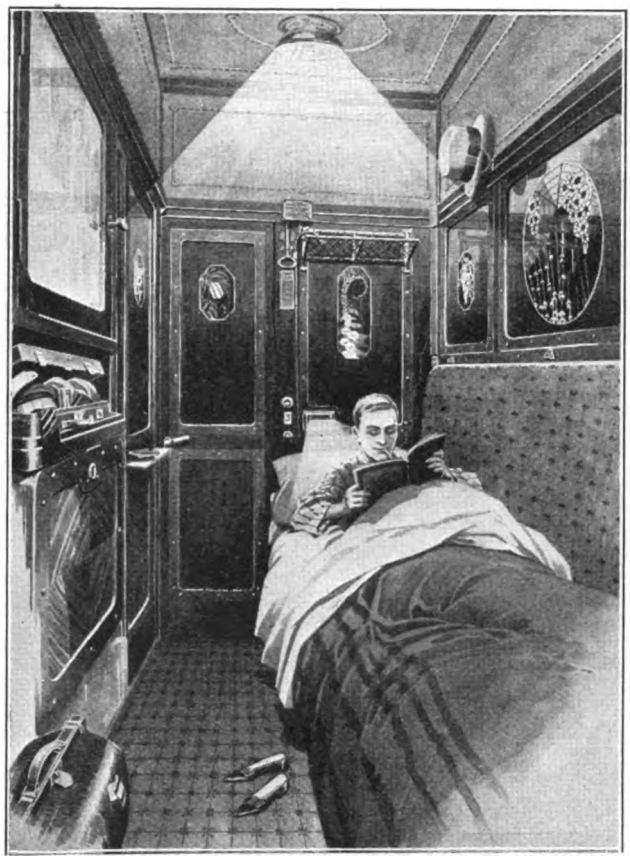
proved that this has been effectively obtained. Wheels, axles and axleboxes are of the Wagons-Lits standard as required by the railways over which the cars will be operated.

Total weight of each vehicle is approximately 53 tons, and, considering the fact that extra equipment has to be provided owing, as explained, to the international character of the services, and in view of the general dimensions of the cars, this may be regarded as by no means excessive; in fact, it is not appreciably heavier than similar carriages built of wood. The weight mentioned is that of the car in full running order, namely, with the water tanks full and the dynamo and accumulator boxes in position.

The cars have been built to the designs of the Leeds Forge Company, as approved by Monsieur Doassans, Chief Engineer of the Compagnie Internationale des Wagons-Lits, and to his inspection, carried out under the supervision of Monsieur Jault, Agent Receptionaire.



COMPARTMENT ARRANGED FOR NIGHT TRAVEL.

Overall dimensions of the vehicles are as follow :—

Length over buffers ..	76 ft. 11⅜ in.
Length over headstocks ..	71 ft. 11⅞ in.
Distance between centres of bogies	52 ft. 6 in.
Wheelbase of each bogie ..	8 ft 2 7/16 in.
Height from rail to top of car roof	13 ft. 1½ in.
Maximum height	13 ft. 2 7/16 in.
Width (maximum) ..	9 ft. 5 5/16 in.
Width over main body corner posts	9 ft. 3½ in.

In view of the fact that these cars were built to Continental standards, but constructed by an inland English firm, the problem of conveying them to a port for shipment involved serious consideration. Inquiries were, in fact, instituted two years ago in regard to these vehicles, whose dimensions are far in excess of any railway stock accepted for running over English railways. There was also grave doubt as to the facilities which could be obtained to convey the coaches across to France if the difficulties of rail transit in this country could be overcome. Consequently, investigation had to be made to ascertain what could be done to effect transit of the cars to various ports for shipment, Hull, Richborough and Southampton being at first given attention as the places most likely to afford the requisite facilities. On account of structural difficulties, however, the Midland Railway Company was obliged to extend inquiries over various alternative routes, as it appeared that there was little prospect of obtaining a clearance of tunnels, overbridges, station platforms, &c., by whichever route the coaches were eventually to be taken. Numerous expedients had to be considered such as the running of templates, the slewing of lines at obvious points of contact, "wrong line" working, &c., in order to find some way

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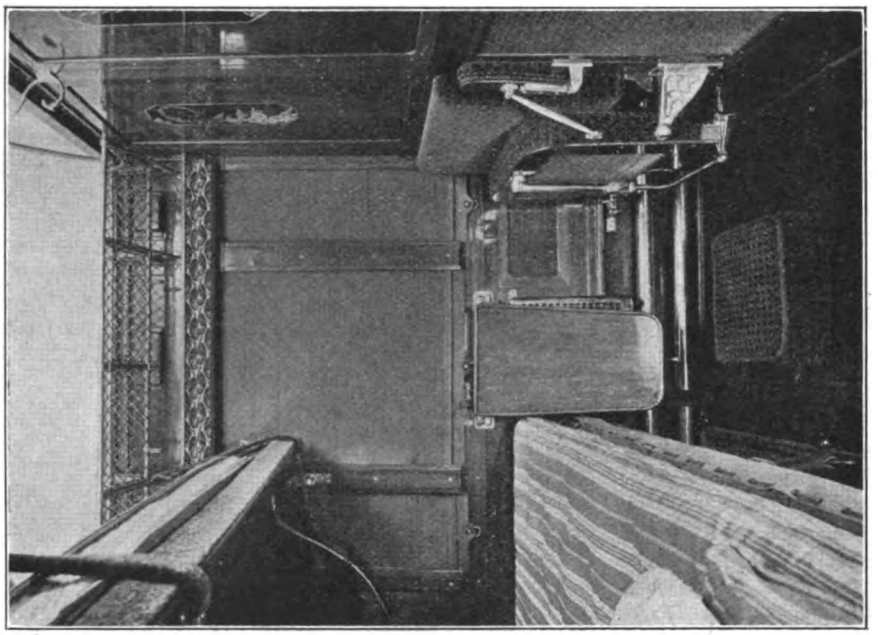
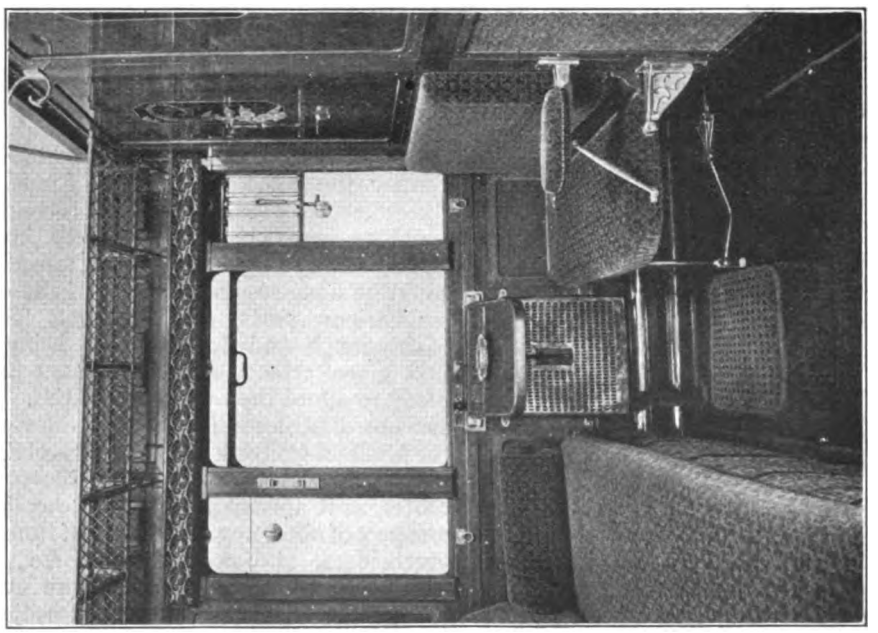


PREPARED FOR NIGHT TRAVEL.



ARRANGED FOR DAY USE.

INTERIOR VIEWS OF TWO-BERTH COMPARTMENT.

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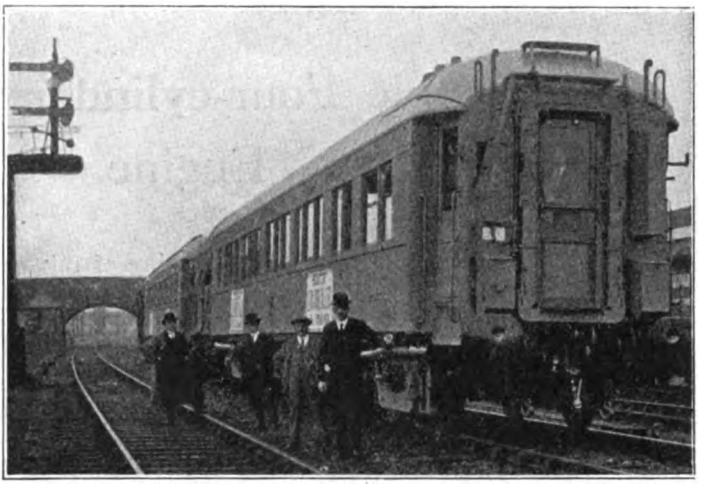
out of the difficulty and admit of the conveyance being undertaken.

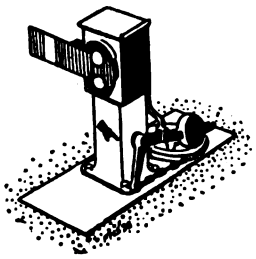
It was eventually decided to concentrate upon Immingham, where accommodation was procurable for the coaches to be stored and finished off, in readiness for shipment in such numbers as the shippers could take over at one time. The difficulties to be overcome in arranging for rail conveyance from the Leeds Forge Company's Newlay Works to Immingham were further accentuated by the fact of the overall dimensions being made even greater than had been at first submitted.



ALL-STEEL SLEEPING-CARS PREPARED FOR TRANSIT.

The first of these coaches was accepted by the Midland Railway Company for forward working by special arrangement on Sunday, July 9, at such dimensions as had been finally approved, for conveyance at slow speed and under the most careful observation, through to Immingham, transfer being made to the Great Central line at Dearne Junction, near Mexborough, for completion of the journey to the port. In compliance with the urgent representations of the makers, the car was allowed to go forward with only such exterior fittings removed as would inevitably have come in contact with fixed structures if left in position. Certain of the roof fittings also remained on at one side, thus necessitating the vehicle being retained in the same position (that is, not reversed) throughout the journey to Immingham.

The special train, which conveyed a number of the Leeds Forge Company's officials and workmen, and was in charge of responsible railway officials, was worked over a carefully selected path, running "dead" slow past all station platforms and awnings, over curves and through overbridge openings, tunnels, &c., a sharp look-out being kept for any possibility of contact, as it was realised that the clearances at many points on the route would be very small. The carriage was safely delivered at Immingham the same day, but the fact of the clearance being almost "nil" at some places and the coach actually rubbing at one station platform, abundantly proved the necessity for the greatest care, and showed that the railway companies' difficulties in accepting and handling such traffic had by no means been over-estimated. Other coaches have since been worked over the same route and under the same conditions, two or more at a time.



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A Notable Four-cylinder 0-6-0 Tank Engine.

WE are indebted to Mr. J. A. Hookham, Chief Mechanical Engineer of the North Staffordshire Railway, for a photograph (reproduced as frontispiece) and particulars of a new 0-6-0 type tank engine designed by him and recently completed at the company's works at Stoke-on-Trent.

This engine is fitted with four single-expansion cylinders having piston valves above them, each valve being worked by a separate Walschaerts gearing. The application of four cylinders and a separate gear to each is certainly unusual in British practice, particularly in combination with the 0-6-0 wheel arrangement applied to a tank locomotive, but this particular engine is distinctive on a further ground, namely, a special disposition of cranks has been employed, the arrangement being as shown in the accompanying diagram, from which it will be seen that each pair of cranks, *i.e.*, those outside and those inside the frames, are set 90 deg. apart respectively, each outside crank being at 135 deg. relatively to the corresponding inside crank on the same side of the engine.

We understand that the engine is being tested on suburban traffic in the Stoke district with a view to proving if possible that, from an acceleration point of view, the engine is better than the ordinary two-cylinder type employed thereon, and of course the cranks as disposed should give an improved turning moment. In a later issue we hope to give some particulars of the working of this engine. Principal dimensions are given on the frontispiece.

The characteristics of this engine are such as to assure certainty in starting and rapid accelerative powers with heavy suburban trains. In a locomotive of this description, having ample boiler capacity, a full sufficiency of cylinder volume, with six coupled wheels of moderate diameter bearing the whole of the weight, all the characteristics necessary for the attainment of the objects mentioned above are present, and, although the type is unusual in the practice of this country, it seems to us to foreshadow possibilities which have not hitherto been fully tried out. The special crank distribution should further aid the realisation of the purposes aimed at.

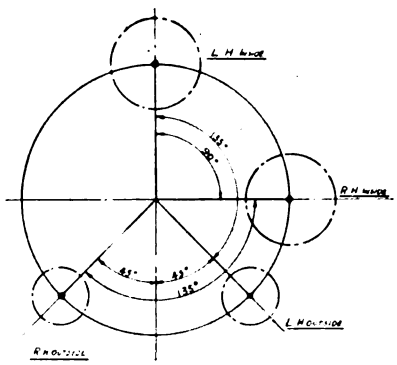

DIAGRAM SHOWING POSITION OF CRANKS, NORTH STAFFORDSHIRE RAILWAY 4-CYLINDER TANK ENGINE.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst.T., A.I.Loco.E.

Photo.] [*Leslie J. Thompson.*

LONDON & NORTH EASTERN RAILWAY.

Up East Coast Day Express, crossing the Forth Bridge. North British Railway locomotives No. 874 "Dunedin," (4-4-2) and 736 (4-4-0).

DESPITE the comparatively frequent appearance of new express locomotive types in this country, it is but seldom that the writer of an article such as this is called upon to record developments in locomotive performance so drastic in character as practically to set up new standards altogether. New engines of types nominally more powerful than those which have preceded them have at times displayed work superior on all counts to that of their predecessors, even if slightly; sometimes the work has been superior uphill, but any gain thereby has been nullified either by disability on the part of the engine or dislike on that of the driver to travel at high speeds downhill or on the level; and sometimes, alas! the performance on the basis of times and speeds achieved has been *worse* on all counts than that of earlier engines rated as of inferior power. But there are no half measures in the superiority of Mr. Gresley's magnificent "Pacific" express engines Nos. 1470 and 1471 on the Great Northern Railway over the Ivatt "Atlantics." Downhill maxima of 79 and 80 m.p.h. and high maintained speeds over level track with enormous trains show that the "Pacifics" run just as freely as the 4-4-2's, and when one notes such times as 6 min. 35 sec. out to Finsbury Park from King's Cross with a 475-ton train, or 7½ min. through those two greasy-railed tunnels with 525 tons, or, yet again, a sustained rate of 50 m.p.h. up a continuous 1 in 200 grade with 475 tons behind the tender, it is indeed time to "sit up and take notice." Briefly, there is no doubt that the new Great Northern engines very distinctly mark the beginning of a new epoch in British standards of express locomotive design and work.

The "Atlantics" have had a lengthy innings. It was in 1898 that Mr. Ivatt produced No. 990—the first of them, or rather of the small-boilered type, which we were told at the time were all to receive large boilers if No. 251 proved successful in working, but which have patiently waited 20 years for this desirable transformation—and 1903 saw the emergence of No. 251 from the shops at Doncaster, so that the large-boilered 4-4-2's have had a vogue of all but 20 years. The first superheated batch — Nos. 1452-1461 — were turned out in 1910, since which year no further express engines have been built on the Great Northern Railway up to the new "Pacifics," but practically all the large-boilered "Atlantics," and a number of the small series, have been rebuilt with

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20 in. by 24 in. cylinders and superheaters. Among the earliest of really large-boilered British types the "251" class, with their 5 ft. 6 in. barrels and unusually small 18½ in. by 24 in. cylinders, exemplified the Ivatt *dictum* that the measure of the tractive power of a locomotive is its "capacity to boil water," and, as we shall see later in the present article, it would probably be impossible to find any other British locomotive type whose work on the road is at times, in so extraordinary a degree, in advance of rated capacity by the tractive force formula.

reached a diameter of between 10 ft. and 15 ft., inspiring the historic *mot* of a well-known railway *litterateur*: "No. 251, bigger-boilered than ever, leers at us from every hoarding!"

Garnering experience from the working, first of his small-boilered "1630" class "Moguls," then from the large-boilered and now numerous "1640" series, and last from the 6 ft. three-cylinder 2-6-0 "1000" class—whose remarkable exploits on express trains of colossal weight during the coal dispute period of 1921 must have afforded much valuable information—

Photo.] LONDON & NORTH EASTERN RAILWAY. [*F. E. Mackay.*

London (King's Cross)—Leeds and Bradford Restaurant Car Express.
Great Northern Railway 4-4-2 locomotive, No. 1400.

This new Ivatt policy completely reversed the previous Stirling policy, as embodied in the 8 ft. single-drivers, of small boilers and very large cylinders; and as a result of the fine initial performances of the "Atlantics" it became possible at once to dispense with piloting—then rife—on the Great Northern Railway, and thereby to institute a rule which has since become rather too inflexible to be reasonable and practical. The Great Northern Railway publicity authorities of the period, by the way, were so impressed by the size of No. 251's boiler that they designed a famous series of posters in which the said boiler, slightly exaggerated, increased progressively in girth until it

coupled with the data available from the 12 years of running of the superheated "Atlantics," Mr. Gresley has now evolved his epoch-marking "Pacific" design. As a matter of fact, the design has actually been prepared for some time, but the construction of the engines has been delayed by the unpropitious circumstances of the last couple of years. Since the new machines have commenced running, considerable haste is being displayed by other railways in following suit; Sir Vincent Raven has now turned out his first "Pacific" engine on the North Eastern Railway, and rumours are strong that a similar move is in contemplation on the London Midland and Scottish Railway,

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where certain expresses—such as the Manchester and Liverpool train due in Euston at 8.10 p.m.—have grown to enormous formations, and require to be piloted daily.

I know that Great Western enthusiasts may remind me at this stage that the Great Western Railway has owned and worked a "Pacific" engine for 15 years past. But it will probably be a matter of general agreement that *The Great Bear* was in advance of her time in every respect. She has never, to my knowledge, displayed a capacity for performance—though this bold claim, indeed, but, from my observations, one that is justifiable.

It is not my intention at the moment to discuss the proportions of the new engines, or there will be no room for the runs, which are doubtless of the greater topical interest at the moment. I purposely avoided travelling behind Nos. 1470 and 1471 during the summer, when they were always on lightly-loaded or easily-timed trains, or both (with the exception of the express reaching King's Cross at 4 p.m. from Leeds), as I did not want to get an underestimate of their capabilities

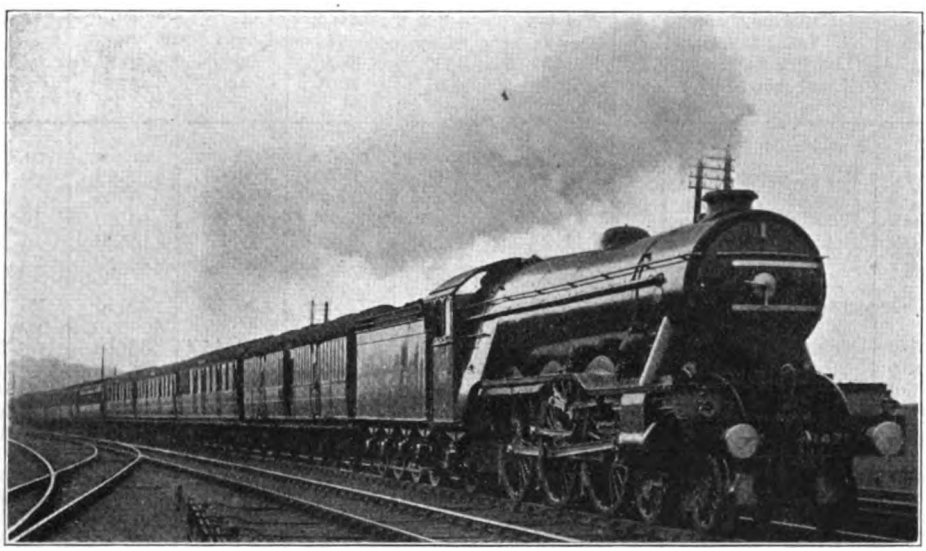

Photo.] LONDON & NORTH EASTERN RAILWAY. [*F. E. Mackay.*

10 a.m. Down East Coast Restaurant Car Express.
Great Northern Railway 4-6-2 locomotive, No. 1471.

may have been due possibly to lack of opportunity—so much as equal, let alone superior, to that of the incomparable four-cylinder 4-6-0 "Stars" of that railway, whose maximum efforts, when capably handled, I am bound to confess I have never known surpassed, or fully equalled—grade for grade and load for load—by any other express locomotive type in this country. That is, until *Great Northern* and *Sir Frederick Banbury* made their *début* on the main line of the Great Northern Railway; but now, at long last, a British type has appeared—granted, a much larger, heavier, and dimensionally more powerful engine—which will, I believe, give a Great Western 4-6-0 points and a beating. A

at the beginning. So the first train on which I timed the running of No. 1470—the 5.40 p.m. down Leeds express—carried its winter loading and tared 447 tons; and by the inclusion of an additional dining car in the Hull portion the *minimum* tare of this train has now been raised to some 496 tons, several 33-35-ton eight-wheelers being also included in the formation. The insertion of an extra corridor third in the Leeds set at week-ends, making a total of 16 vehicles and 70 axles, brings the tare up to about 525 tons, and the full weight, with a normal passenger complement, to at least 550 tons, if not more.

Yet still harder than this, in my judgment, is the performance exacted on the

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10.51 a.m. from Doncaster (10 a.m. from Leeds), due in King's Cross at 1.55 p.m. Why precisely the Great Northern time-table authorities should have selected the one 4-hour Leeds express—excepting the much lighter 3.15 p.m. up—which makes as many as six intermediate stops (seven on Wednesdays), and carries in addition the second heaviest load on the service, for expedition to 3 h. 55 min., is a distinct mystery. Nevertheless, one of the 2 min. less than the pre-war allowance when the train was but little over one-half this weight, and a very far more exacting booking than 84 min. would be in the opposite direction. Yet the best down expresses, one and all, are allowed 87 min. from London to Peterborough.

There can be little doubt that, in consideration of road and load, the haulage of this 10.51 a.m. express from Doncaster to London is, by a substantial margin, the

L. & N. E. (GREAT NORTHERN) RAILWAY: KING'S CROSS—PETERBOROUGH.

Distance.	Engine No.: / Engine Type: / Load (axles): / Load (tons tare): / Load (tons full):	Schedule.	1440 4-4-2 47 322 335	1444 4-4-2 *43 343 360	287 4-4-2 54 387 400	1450 4-4-2 *50 388 410	1470 4-6-2 60 447 475	1471 4-6-2 66 496 525
Miles.		min.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	King's Cross ..	0	0 00	0 00	0 00	0 00	0 00	0 00
2·5	Finsbury Park	—	8 15	8 40	7 40	7 15	6 35	7 30
5·0	Wood Green ..	—	11 35	12 00	11 05	10 50	10 00	10 55
9·2	New Barnet ..	—	17 35	17 10	16 45	17 05	15 20	16 30
12·7	Potter's Bar ..	—	23 10	22 55 sigs.	21 55	22 55	20 10	21 25
17·7	Hatfield	25	28 40	30 15	27 10	28 40	25 15	26 35 p.w.r.
25·0	Knebworth ..	—	36 25	39 00	34 55	36 45	33 10	36 25
28·6	Stevenage ..	—	40 15	42 35	38 40	40 30	36 50	40 05
31·9	Hitchin	40	43 25	45 25	41 40	43 40	40 05	43 05
37·0	Arlesey	—	47 30	49 25	45 40	47 40	44 30	47 10
44·1	Sandy	—	53 25	55 10	51 25	53 40	51 20	53 10
51·7	St. Neots ..	—	60 05	61 50	58 10	60 35	59 10	60 05
58·9	Huntingdon ..	67	66 20	68 00	64 35	67 05	66 10	66 45
62·0	Leys Box	—	69 30	71 20	67 55	70 30	69 40	70 10
69·4	Holme	—	76 15	78 00	74 55	77 15	76 40	77 10
75·0	Fletton Junction	—	82 45	83 10	80 30	82 35	82 30	82 45
76·4	Peterborough ..	87	85 20	85 35	83 00	84 30	85 15	85 00
76·4	Net times (min.)	87	†83½	‡82½	†82½	84½	†84	†82½

Allowance made in net times for easy running: † Holme-Peterborough. ‡ Fletton-Peterborough.
* Includes Gresley Quintuple Dining Car Set.

"Pacifics" is required daily to take a train of round about 450 tons from Doncaster to Retford, 17·3 miles, in 21 min., start-to-stop, and from there up to Markham Summit, down to Newark, and on up the long ascent to Grantham, 33·1 miles in all, in 38 min., not to mention an additional stop at Newark on Wednesdays without increase of schedule time (the Wednesday feat is almost an impossibility, "Pacific" or no "Pacific"); at Grantham the load becomes 485 or 490 tons, and the next 29·1 miles to Peterborough are allowed 33 min., the final schedule over the 76·4 miles to town being 84 min., stiffest winter daily task set to any British express passenger locomotive to-day; and the 5.40 p.m. out of King's Cross, with a heavier train still but rather easier times, makes a good second. By comparison, the 12.52 p.m. from Doncaster, on which the engine for the 5.40 p.m. works up to London, is of only moderate difficulty until after Peterborough, where the load gets made up to 410-450 tons, with 86 min. allowed to London; while the 4.0 p.m. down Leeds, on which the engine of the 10.51 a.m. *ex*-Doncaster returns to shed, save in the starting of its heavy load out to Finsbury Park, is with its sluggish

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timing a plaything for a "Pacific." Thus the two engines are making, day in and day out, except Sundays, a mileage of 312, which, with runs to and from shed at both ends, gives a weekly total of round about 1,900 miles. But if one of them is laid off for any of the thousand and one reasons which may entail a minor shed repair, a serious proposition is created at once, as this way, instead of the 62-axle train making three stops immediately in front of the 34-axle train, which has to be detained at York no less than *seventeen minutes*, and to crawl from there to Retford in order to avoid overtaking its predecessor, the loads would be equalised to 46 and 52 axles respectively; the heavier train—from Newcastle and Hull—might

L. & N. E. (GREAT NORTHERN) RAILWAY: PETERBOROUGH—KING'S CROSS.

Distance.	Engine No.: / Engine Type: / Load (axles): / Load (tons tare): / Load (tons full):	Schedule.	294 / 4-4-2 / 38 / 273 / 290	289 / 4-4-2 / 42 / 285 / 300	Schedule.	300 / 4-4-2 / 56 / 393 / 410	1444 / 4-4-2 / 54 / 389 / 410	1454 / 4-4-2 / 56 / 418 / 440	1471 / 4-6-2 / 56 / 392 / 410	1470 / 4-6-2 / 60 / 429 / 455
Miles.		min.	m. s.	m. s.	min.	m. s.	m. s.	m. s.	m. s.	m. s.
0·0	Peterborough ..	0	0 00	0 00	0	0 00	0 00	0 00	0 00	0 00
3·8	Yaxley	—	6 35	6 50	—	7 00	7 10	7 00	6 30 sigs.	6 45
7·0	Holme	—	9 40	10 00	—	10 30	10 40	10 15	10 10	9 50
12·9	Abbot's Ripton ..	—	15 55	16 00	—	17 25	17 25	16 20	19 10	15 55
14·4	Leys Box	—	17 50	17 50	—	19 25	19 30	18 15	21 10	17 35
17·5	Huntingdon ..	20	20 50	20 50	22	22 40	22 50	21 20	24 15	20 35
24·7	St. Neots ..	—	27 20	27 45	—	29 15	29 40	27 45	30 50	27 25
32·3	Sandy	—	34 45	35 30	—	36 55	37 25	35 00	38 05	35 00
39·4	Arlesey	—	42 00	42 45	—	45 25	45 00	42 20	45 15	42 30 sigs.
44·5	Hitchin	48	47 15	48 10	50	51 30	50 50	47 55	50 50	48 55
47·8	Stevenage ..	—	51 20	52 30	—	56 20	55 35	52 35	54 55	54 20
51·4	Knebworth ..	—	55 15	56 30	—	60 50	60 10	57 00 sigs.	58 50	58 40
54·4	Welwyn	—	58 25	59 45	—	64 15	63 35	61 15 sigs.	61 55	62 00
58·7	Hatfield	64	62 00	63 30	66	68 15	67 35	67 15	65 45	65 45
63·7	Potter's Bar ..	—	67 35 p.w.r.	68 45	—	73 35	72 40	73 10	71 10	70 55
71·4	Wood Green ..	—	76 40	75 45	—	81 00	80 05	80 35	78 30 sigs.	77 55
73·9	Finsbury Park ..	—	79 25 sigs.	78 10 sigs.	—	83 30	82 25	83 05	81 20 sigs.	80 25
76·4	King's Cross ..	84	84 15	82 55	86	87 35	86 40	87 05	86 30	84 40
76·4	Net times (min.)	84	81	82	86	87½	86½	*83	81	82

* Run made on 84-min. schedule.

such trains as the 10.51 from Doncaster or the 5.40 p.m. from King's Cross are practically beyond "Atlantic" hauling capacity.

In the up direction, however, there would seem a far simpler and more practical solution, which would also be considerably to the benefit of passengers. Why not get that ill-starred 8.0 a.m. "express" from Newcastle to London *in front* of the 10 a.m. from Leeds at Doncaster, let it attach the Hull portion of the Leeds train, and run in advance to London? In then stop at Grantham only, while the Leeds train, behind, made the stops at Retford and Peterborough. Recently I prepared a detailed table of times which shows how easily this change might be effected, saving passengers from York and the North to London some 30 or 35 min. on their journeys—and incidentally doing away with the rebuke of an important express train service which is still 40 min. slower than in pre-war days—while the Leeds train, relieved of a material part of its load, and of the Grantham stop, would

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not only gain greatly in punctuality, but might even be expedited. Certain other slight alterations would be entailed, on which I do not propose to enter here, but the rearrangement proposed is a logical and simple one, and would be of material benefit all round.

But now let me proceed without further preamble to the runs. They are, as will be seen, embodied in four tables—half-a-dozen on 87-min. bookings from King's Cross to Peterborough, and seven in the harder up direction; then a collection in both directions between Peterborough and colossal loads during the war and post-Armistice years, which I gave in the same number.

Of the first four down runs Nos. 1, 2 and 4 were made on the 10.10 a.m. Leeds express, and No. 3 on the 11.20 a.m. of last summer to Harrogate and Scarborough. The last-mentioned was a trip which well illustrates the folly of judging by appearances. I had to travel at very short notice down to March in Cambridgeshire, and having missed the 10.5 a.m. from Liverpool Street, conceived the idea of catching the 11.20 from King's Cross

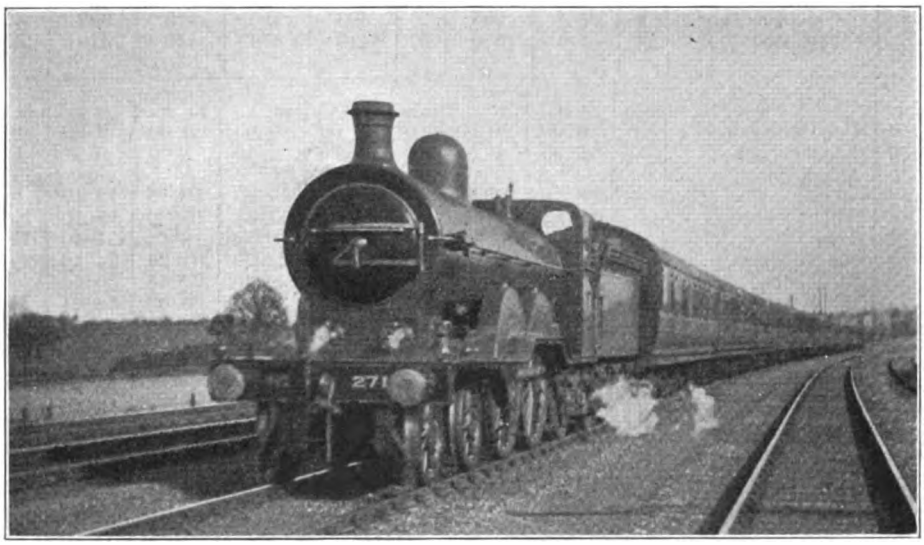

Photo.] LONDON & NORTH EASTERN RAILWAY. [*R. Hall.*

Down Yorkshire Express from King's Cross.
Great Northern Railway inside cylinder 4-4-2 locomotive No. 271.

Doncaster. The selection of stations and passing points shown in the tables is designed chiefly to show in detail the work uphill, both by "Atlantics" and "Pacifics," on what are, in the main, exceedingly heavy trains. As regards the gradients, I would refer readers to the profile of the Great Northern main line which appeared under the frontispiece of the August, 1921, issue, in connection with the working of the three-cylinder "Mogul" engines on very heavy passenger express trains during the coal dispute period of that year. They may also be interested to compare with the runs about to be described the table of "Atlantic" and 2-6-0 runs over the Great Northern Railway main line with to Peterborough, due 12.47 p.m., and of making there a somewhat risky connection with the Great Eastern 12.50 p.m. train, which, of course, was in no way a booked connection. Arriving at King's Cross, I found there a train at least 50 per cent. heavier than I expected (this was right at the beginning of the season), and, to crown all, the dingy appearance of the engine appeared to foretell a very early visit to "Plant" for overhaul. So I rather gave up hope—until we started, when No. 287 made a fine exit to Finsbury Park, and the best time of the whole series on to Knebworth, followed by very fast running on to Huntingdon, and concluding with an arrival at Peterborough

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precisely four minutes early! Looking "not on the outward appearance" obviously applies with equal force in the realm of locomotive performance as elsewhere! Furthermore, I had not exchanged a single word with the driver; nor did I, indeed, on any one of the journeys described.

As regards speed details, No. 1440 passed Potter's Bar at 37 m.p.h., touched 69 at Hatfield, fell to 46½ at Woolmer Green, and then maintained 77½ past Three Counties; from Biggleswade to Tempsford speed varied between 69 and 82 min.—and with a load at least 40 per cent. above pre-war.

No. 287 was doing exactly 40 m.p.h. at Potter's Bar and touched 69 at Hatfield; thence we fell to 48½ m.p.h. at Woolmer Green, touched 79 after Hitchin, with 75 before and 72½ after Sandy, whence we topped St. Neots at 61½ and Leys at exactly 50 m.p.h., touching 70½ at Offord and 72½ at Holme. Here again, without the leisurely finish, we might have stopped without difficulty in 82 min.; as it was we were still 4 min. early with this heavy train. No. 1450 made a brilliant start to

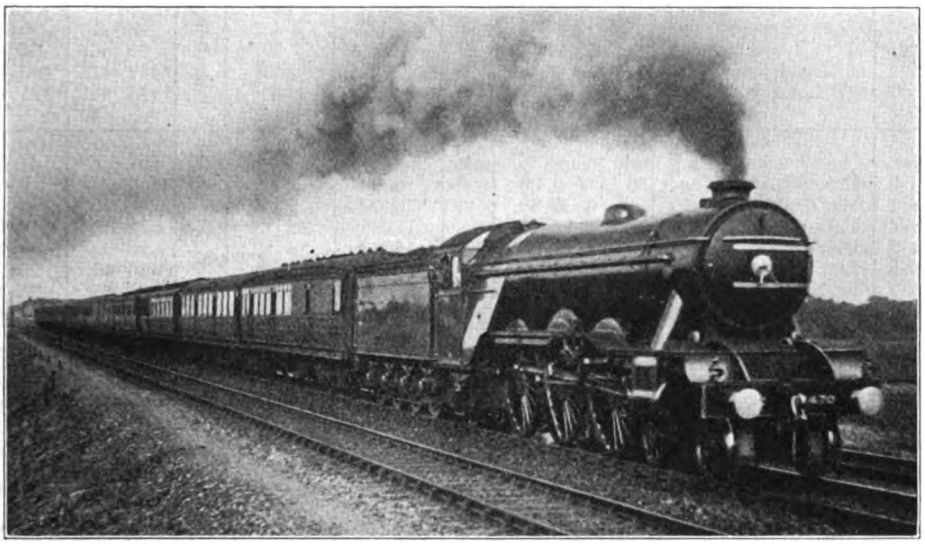

Photo.] LONDON & NORTH EASTERN RAILWAY. [*Henry L. Salmon.*

Harrogate-London Restaurant Car Express.
Great Northern Railway 4-6-2 locomotive No. 1470, "Great Northern."

74 m.p.h., falling to 65 m.p.h. at St. Neots and 53½ up Stukeley bank, and rising again to 72½ at Offord and 74 at Holme, whence we ran very slowly to avoid too early an arrival. No. 1444 made a slower start to Finsbury Park, with a heavier train, but passed Potter's Bar at 39 m.p.h., and then got signals very badly on at Red Hall. But we went magnificently from Stevenage onwards, touching 80½ m.p.h. below Hitchin, running from Biggleswade to Sandy at 75–76½, and passing St. Neots at 64½, Offord at 72½, Huntingdon at 67, Leys Summit at 51, and Holme at 75 m.p.h., which brought us into Peterborough 1½ min. early, check notwithstanding, in a net time practically equal to the pre-war Finsbury Park with 410 tons, but fell off a little from there on to Potter's Bar; beyond Hitchin, however, we touched 80½ m.p.h., and again kept up a high speed on to Huntingdon, with a minimum of 61 m.p.h. at St. Neots and a maximum of 71½ at Offord, after which we fell to 50 at Leys Box, and touched 75 at Holme. Average speed on these four runs over the 30·3 miles between Stevenage and Holme—generally, but by no means exclusively favourable to engine—with an average train-load of 375 tons, were 69·7, 71·5, 70·4 and 68·4 m.p.h. respectively, and the average rate through from Potter's Bar to Fletton Junction was in all cases round about the 64 m.p.h. mark for 62·3 miles on end.

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The first electrifying feature of No. 1470's performance with 475 tons was a start to Finsbury Park in 6 min. 35 sec.; thence 53 m.p.h. was the speed attained at Wood Green, 45 m.p.h. the maintained speed up most of the 1 in 200, with a fall to 43 at Potter's Bar, 67 m.p.h. the maximum at Hatfield, and 49 the minimum at Woolmer Green. We were now so far ahead of all other competitors and had time so well in hand that it was idle to opportunity for time recovery, and any doubts as to the speed capacity of the engine were set at rest by a maximum of 79 m.p.h. at Three Counties, and fast running on to Huntingdon practically equal to that of the "Atlantics." We were doing 74 m.p.h. at Biggleswade, 67 at Sandy and 70½ beyond, 61 at St. Neots and 68 at Offord, 48½ at Leys and 69 at Holme—all notable figures with so vast a load. It is worthy of record that these

L. & N. E. (GREAT NORTHERN) RAILWAY: PETERBOROUGH—DONCASTER.

Distance.	Engine No.: / Engine type: / Load (axles): / Load (tons tare) / Load (tons full)	Schedule.	293 / 4-4-2 / 44 / 308 / 325	Schedule.	273 / 4-4-2 / 47 / 322 / 335	1436 / 4-4-2 / 50 / 388 / 410	Schedule.	1470 / 4-6-2 / 60 (56) / *447 (413) / *475 (440)	1471 / 4-6-2 / 66 (62) / *496 (462) / *525 (490)
Miles.		min.	m. s.	min.	m. s.	m. s.	min.	m. s.	m. s.
0·0	Peterborough ..	0	0 00	0	0 00	0 00	0	0 00	0 00
3·1	Werrington Junc. ..	—	6 30	—	6 00	6 35	—	6 25	6 25
8·4	Tallington	—	12 00	—	11 35	12 15	—	12 05	12 10
12·2	Essendine	—	15 50	—	15 30	16 10	—	16 00	16 15
15·8	Little Bytham ..	—	19 35	—	19 30	20 05	—	19 45	20 25
20·7	Corby	—	25 20	—	26 00	26 20	—	25 35	27 15
23·7	Stoke Box	—	29 05	—	30 15	30 20	—	29 35	31 45
29·1	Grantham	37	34 55	37	36 45	36 35	37	36 15	38 05
4·2	Barkstone	—	7 25	—	7 05	7 05	—	7 20	7 25
9·9	Claypole	—	12 35	—	12 10	12 00	—	12 20	12 35
14·6	Newark	17	16 55	17	16 15	15 55	16	16 20	16 45
20·9	Carlton	—	22 50	—	22 10	21 25	—	21 50	22 25
26·5	Tuxford	—	28 30	—	28 20	27 30 p.w.r.	—	27 45	28 20
28·3	Markham Box ..	—	30 35 sigs.	—	30 35	30 00	—	29 55	30 40
33·2	Retford	38	36 30	37	35 30	36 35	36	35 10	35 55
38·5	Ranskill	—	8 30	—	41 10	42 25	—	40 45	41 20
42·3	Bawtry	—	12 00	—	45 00	46 05	—	44 45	45 10
43·9	Piper's Wood Box..	—	14 05	—	47 05	48 00	—	46 50	47 15
50·5	Doncaster	21	20 55	56	55 10	55 50	55	54 55	54 55

* Loading shown in brackets indicates reduced load north of Grantham.

hurry further; so 71½ m.p.h. was the maximum at Three Counties, and very easy running followed, with the exception of the minimum of 50 m.p.h. at Leys, and the maximum of 72½ before Holme. No. 1471, with her colossal train, and no chance of a "run" at the initial 1 in 105-110 ascent through the tunnels, started steadily to Finsbury Park, but still with a better time than that of all the "Atlantics" but one; touched 52 m.p.h. at Wood Green and passed Potter's Bar at 42, after which came a nasty check at Hatfield. But this gave just the desired six down trips show an average actual arrival 2¼ min., and an average net arrival 4 min. before schedule, which is a fine record. And this is characteristic of Great Northern running in the down direction, where it is in my experience very rare for time to go against the engine; I could quote numerous recent runs in support of this assertion, but I have naturally chosen the best "Atlantic" trips for comparison with those made by the "Pacific" engines. In this connection I have for once allowed in the net times in respect of the obviously

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"easy" running at the conclusion of most of the trips in this table, and I think fairly, as the easing was so clearly to avoid unduly early arrivals.

Continuing northwards from Peterborough, I have introduced first a trip on the 7.15 a.m. out of King's Cross, on which No. 293, having already achieved a time of 84¼ min. to Peterborough (which included exactly 20 min. to Potter's Bar, passed at 46½ m.p.h., and 25 min. 10 sec. first, reached 60 m.p.h. at Tallington, passed Bytham at 50, and Stoke Summit at 41, while No. 1436, on the fourth, also was doing 60 at Tallington, but passed Bytham at 53 and breasted Stoke Summit at 41½, with a subsequent maximum of 66 m.p.h.

No. 1470, with the 475-ton train, was through Werrington at 53 m.p.h. and Tallington at 60, which rate was continued on to Essendine up rising grades of 1 in

L. & N. E. (GREAT NORTHERN) RAILWAY: DONCASTER—PETERBOROUGH.

Distance.	Engine No.: / Engine type: / Load (axles): / Load (tons tare): / Load (tons full):	Schedule.	1453 / 4-4-2 / 42 / 285 / 300	1454 / 4-4-2 / *52 (56) / *384(418) / *405(440)	1470 / 4-6-2 / *58 (62) / *424(458) / *455(490)	Distance.	Schedule.	1406 / 4-4-2 / 44 / 311 / 325	1471 / 4-6-2 / 48 / 334 / 350	1470 / 4-6-2 / 48 / 346 / 365
Miles.		min.	m. s.	m. s.	m. s.	min.	min.	m. s.	m. s.	m. s.
0·0	Doncaster ..	0	0 00	0 00	0 00	0·0	0	0 00	0 00	0 00
6·6	Piper's-Wood Box	—	8 55	10 40	9 40	6·6	—	9 35	9 20	9 45
8·2	Bawtry	—	10 40	12 40	11 35	8·2	—	11 30	11 05	11 30
12·0	Ranskill	—	14 10	16 15	15 05	12·0	—	15 00	14 35 sigs.	14 55
17·3	Retford	21	20 20	22 00	21 20	17·3	21	20 15	20 00	20 00
4·9	Markham Box ..	—	8 15	9 05	8 50	22·2	—	25 50	25 50	25 55
12·3	Carlton	—	15 00 p.w.r.	15 55	15 35	29·6	—	32 55	32 55	33 00
18·6	Newark	21	21 30	21 25	21 45	35·9	42	39 20	38 55	39 25
4·7	Claypole	—	7 20	26 15	7 25	40·6	—	45 00	43 55	44 35
8·6	Hougham	—	11 25	30 25	11 30	44·5	—	50 20	48 20	49 10
10·4	Barkstone	—	13 30	32 45	13 35	46·3	—	52 50	50 45	51 25
14·6	Grantham ..	38	18 50	38 25	19 05	50·5	60	59 15	56 55	57 15
3·5	Great Ponton ..	—	7 05	8 55	7 15	3·5	—	7 35	6 50	7 05
5·4	Stoke Box ..	—	9 50	11 20	10 05	5·4	—	10 40	9 30	10 05
8·4	Corby	—	13 00	14 50	13 20	8·4	—	14 00	12 40	13 05
16·9	Essendine ..	—	19 55	21 55	20 20	16·9	—	20 50	19 30	20 30
23·6	Helpston	—	25 35	27 40	26 05	23·6	—	26 35	25 00 sigs.	26 50
26·0	Werrington Junc.	—	27 45	29 45	28 15	27·0	—	28 50	27 20 sigs.	29 05
29·1	Peterborough ..	33	31·25	33 25	32 25	30·1	34	32 55	33 20	34 00

* Loading shown in brackets indicates total load as made up at Grantham.

to Hatfield), proceeded to gain 2 min. on the 37 min. allowance to Grantham. And I might add that my last previous trip on the same train, with 305 tons, gave a time of 35 min. 10 sec. over the same length, following exactly 84 min. to Peterborough, allowed 87 min. No. 293 actually passed Bytham, well up the ascent, at 55½ m.p.h., only fell to 49 on the 1 in 200 before Corby and picked up to 52 through the station, fell to 46 at Stoke Summit, and touched 69 before Grantham. Only two of my 10.10 a.m. trips continued beyond Peterborough; No. 273, on the 440 and 1 in 264. At Little Bytham, when we were over a mile on to the 1 in 200, the speed was still 55 m.p.h., and on the upper part of the same ascent for a full mile we maintained exactly 50 m.p.h.—with such a load as 475 tons behind the tender a unique feat in my experience, as it is hardly necessary to mention. There was a momentary fall to 49 just before we reached the short Corby "level," where speed increased to 52 m.p.h.; then we went up the final 3 miles at 1 in 178 at a minimum rate of 46 m.p.h. Had we not descended with such excessive caution

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from Stoke into Grantham, we might easily have completed this run in 35¼ or 35½ min. But No. 1471, with the 525-ton train, although making a start out to Essendine practically equal to that of No. 1470, was not put to the ascent with the same vigour as was No. 1470; speed fell to 53 m.p.h. at Essendine; 49 at Bytham; 40½, recovering to 45, at Corby; and 36½ at Stoke Summit, after which we touched 64½ in descending to Grantham. The loss of a minute on this length was the only slight disappointment I have yet experienced behind either "Pacific" engine. It is very important to note that, whereas the "Atlantic" engines on both the second and third runs were afforded help in rear out of the platform at Peterborough, no such assistance was given to the "Pacifics," which makes the starting performances of the latter all the more noteworthy.

There is less of importance to note on the continuation runs to Doncaster. The 7.15 a.m. down is allowed 38 min. from Grantham to Retford, and 21 min. on to Doncaster, both of which timings were observed with ease; indeed, No. 293 gained 1½ min. on the former, despite a signal check, making a total of fully 7 min. gain to engine from London. We touched 64½ m.p.h. at Bawtry and 69 at Black Carr, with an intervening minimum of 51 at Piper's Wood. No. 273 touched 71½ m.p.h. at Claypole and 69 before Retford, with minima of 46½ at Markham and 44 at Piper's Wood; No. 1436 started brilliantly to Carlton, where "even time" had nearly been achieved, with a maximum of 75 m.p.h. at Claypole, and a well sustained rate over the level across the Trent valley; after the p.w.r. check at Markham again we did well, with a top speed of 64½ m.p.h. at Bawtry and a minimum of 51 at Piper's Wood. So both engines were well inside their allowance of 56 min. from Grantham to Doncaster; No. 1436's net time, indeed, was as little as 54 min. for this 50½ miles' run, with a train of 410 tons. Both the "Pacific" engines got away well from Grantham, but so easy a course as that on to Doncaster hardly displays them to their best advantage, especially as both trains were dead on time. The speeds of Nos. 1470 and 1471 respectively were 74 and 72½ m.p.h. at Claypole, 67 and 66 at Carlton (still sustained after the Trent valley 6-mile "level"), 47½ and 42½ at Markham Summit, 64½ and 67 before Retford (in both cases very easy running here), and 48½ and 48 m.p.h. at Piper's

Photo.] LONDON & NORTH EASTERN RAILWAY. [*Chas. S. Lake.*

Up Goods Train at Biggleswade. Great Northern Railway 2-6-0 locomotive No. 1631.

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Wood summit, which running brought us in on both occasions, despite very modest speeds past Rossington and the usual exceedingly slow finish round into the Western platform at Doncaster, within 5 sec. of schedule time.

The up journeys consist, first of all, of two "Atlantic" and one "Pacific" runs on the 10.51 a.m. from Doncaster, followed by one "Atlantic" and two "Pacific" trips on the 12.52 p.m. up. The first journey was made when the 10.51 a.m. was carrying its summer load, and the correspondence between these times and those of No. 1470 in the third column is remarkable. Not only was the "Pacific" loaded 50 per cent. more heavily than the "Atlantic" from Doncaster, and well over 60 per cent. more heavily from Grantham, but the latter run was made on a day in the week before Christmas, when the barometer had fallen to abysmal depths, and rain in torrents and snow were being hurled across the track by what was at first a furious north-east wind, but later veered round to a perfect hurricane from the south-west, experienced in full force after we left Peterborough. Yet even in such conditions as these the "Pacific" practically held her own, the total loss on the "Atlantic's" times to Peterborough being only 2½ min. No. 1453 touched 56½ m.p.h. at Black Carr, and 69 at Scrooby troughs, the minimum at Piper's Wood being 53 m.p.h.; No. 1470's corresponding figures were 53, 66 and 48½ m.p.h.

Out of Retford, with a mile level on starting, and then 3¼ miles up at 1 in 178–200, the two engines accelerated to 45 and 43½ m.p.h. respectively, and the maxima at Crow Park were 74 and 72½ m.p.h.; the times to Newark stop, considering the stiff climb from the start, were extraordinarily smart, and No. 1454's net time was only 21 min. or a shade over, allowing for a p.w.r. check just before the stop. Then followed two magnificent efforts, up almost entirely rising grades, from Newark to Grantham; beyond Claypole, after six miles gradually rising, speeds rose to 59 and 57½ m.p.h.; at Peascliffe Tunnel, after 1¼ miles at 1 in 550, 2 at 1 in 300, and 2¼ at 1 in 200, we had not fallen below 50 and 50½ m.p.h.—very notable figures in both cases, and especially that of the "Pacific" with its 455-ton train-load. Actual times from Retford to Grantham, inclusive of Newark stop, were 41 min. 10 sec. and 41 min. 35 sec.; running times were 40 min. 20 sec. and 40 min. 50 sec.; while the net non-stop times, allowing for this conditional stop, were 36¾ and 37½ min., as nearly as I can estimate. No. 1454 also ran exceedingly well, with a load only 50 tons less than the "Pacific" and no Newark stop, the time of only 16 min. 50 sec. from Newark up to Grantham in particular being wonderfully good.

A non-stop timing of 60 min. from Doncaster to Grantham, instead of one of 61 min. covering a stop of 2 min. at the worst possible intermediate point, not to mention a much lighter load, makes the 12.52 p.m. up express from Doncaster a mere holiday outing for the new engines, and it was even possible, after "Atlantic" No. 1406 had made a fine start to Carlton, with minima of 48 m.p.h. at Piper's Wood and 46 at Markham, and maxima of 66 at Scrooby and 70½ at Crow Park, markedly to ease the latter engine also for the rest of the run. No. 1471 topped Piper's Wood at 52½ m.p.h., touched 67 at Scrooby, but was slightly slacked by adverse signals before Retford; minimum rate at Markham was then 48½ m.p.h. and maximum at Crow Park 70½; and Peascliffe Tunnel was entered at 42½ m.p.h., with the engine running under very easy steam. Despite this we were 3 min. early on arrival at Grantham. No. 1470 lost about ½-min. at starting by brakes leaking on, but went up to Piper's Wood at a minimum rate of 53 m.p.h., touched 70½ at Scrooby, and did some fast running on to Retford, after which again we ran very easily; Markham was topped at 43 m.p.h. and Peascliffe at 47½, with an intervening maximum of 70½ at Crow Park, but even so we were 2¾ min. early.

We have now the six runs from Grantham to Peterborough, commencing with 5¼ miles up at 1 in 200 practically from the platform end. No. 1453 attained 43½ m.p.h. on this climb, with 300 tons, and No. 1406 37½ m.p.h. with 325 tons, while No. 1454 with 440 tons achieved 34½ m.p.h.; against these speeds Nos. 1471 and 1470, with 350 and 365 tons, got up to 45 (the fastest ascent of the series) and 41 m.p.h., but the crowning achievement was that of No. 1470 with 490 tons, on the day of exceedingly bad weather, when we reached 41 m.p.h. at Stoke. On the

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succeeding descent the speed capacity of the " Pacifics " was again notably demonstrated on the fifth run, when No. 1471 made the speediest of all the times from Corby to Helpston, averaging 74 m.p.h. for 15·2 miles, and touching 80½ below Bytham. But for the signal checks which followed, we should have reached Peterborough in 30½ or 30¾ min. for the 29·1 miles. On the other runs No. 1453 touched 79 m.p.h., and took under 31½ min. from start to stop; No. 1454 with 440 tons reached 75 m.p.h., and No. 1470, battling against the wind with her 490 tons, 77½ m.p.h., the time of 32½ min. to Peterborough in these circumstances being extraordinarily good; No. 1406 maintained 79 m.p.h. for 3 miles on end, without touching the magic " 80 "; but No. 1470 on the last trip was not hurried, and did not exceed 71½ m.p.h.

This brings us to the last table, from Peterborough to London, which contains, as judged by pre-war standards of running, some astonishing performances. There is but little to choose between the efforts of " Atlantics " Nos. 294 and 289, the former on the Newcastle express due at 2.10 p.m. and the latter on the immediately preceding 1.55 p.m. from Leeds, in continuation of No. 1453's run from Doncaster. No. 294 did the best out to Holme, where speed reached 64½ m.p.h. on both trips; then No. 289 maintained exactly 50 m.p.h. to the summit of the 4½ miles at 1 in 200 of Ripton bank, against No. 294's 48, so that the two trains had drawn level on passing Leys Box. But then No. 294, with the unusual maximum rate of 74 m.p.h. at Huntingdon (against 69 by No. 289) began to draw ahead, and achieved some sterling running on to Hatfield, the time of 26 min. 25 sec. for the 27 miles from Huntingdon to Hitchin, whose tendency is mainly, and in the last few miles, steeply against the engine, and also the minimum rate of 49 m.p.h. at Stevenage, after a continuous climb of 8 miles finishing with 4½ at 1 in 200, being both achievements of the very first order. Being well on time, we eased somewhat from Hatfield, and then two checks prevented us from bettering the 84-min. schedule, although the net time was nothing more than 81 min. No. 289 was more fortunate, and touching 69 m.p.h. at Hatfield, going well up to Potter's Bar with a minimum of 53, and finishing with a burst at 75 past New Southgate, we stopped in just under 83 min., despite a concluding signal check, which made the net time about 82 min.

LONDON & NORTH EASTERN RAILWAY.

Sheffield and Manchester Express leaving Marylebone Station, London.
Great Central 4-4-0 locomotive (" Director " class).

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Next come two "Atlantic" journeys on the noon express from Leeds, allowed 86 min. from Peterborough to London, a booking which these engines in normal circumstances are hard put to it to maintain; it will be seen that there was a slight loss in both cases, despite excellent running. No. 1444 fell gradually behind as far as Sandy, when there was a complete change of conditions, the work of this engine improving in as great a degree on to Hitchin as that of No. 300 temporarily fell off. No. 300 touched 57½ m.p.h. at Holme, 70½ beyond Huntingdon and 65 at Tempsford, while the minima were 43½ m.p.h. at Ripton, 56½ at St. Neots and 40½ at Stevenage; No. 1444 was doing 60 at Holme, but fell to 41½ at Ripton, did not exceed 67 at Offord and fell to 55 at St. Neots and 40 at Stevenage. But a brilliant time of 5 min. 5 sec. was made from Hatfield to Potter's Bar, speed falling only from 72½ m.p.h. at the former to 53½ at the latter, and the maximum at New Southgate was 71½ m.p.h., the inward time of 19 min. 5 sec. from Hatfield to King's Cross with this load being notable for an "Atlantic."

The fifth run in this table is something more than an exceptional piece of work; it is in my judgment a phenomenon—one of those barely believable and altogether unexplainable feats that come under the notice of a recorder but once in a very long while. I hardly realised the extraordinary merit of this run, indeed, at the time of making it, but I was under no illusion when I came to set it down in the table. Despite 30 tons additional load, the superiority over the two preceding trips is absolute right from Yaxley onwards; by Knebworth it runs to between 3 and 4 min. We were doing 62½ m.p.h. at Holme, and fell only to 47½ at Ripton; 70½ m.p.h. was the maximum reached at Huntingdon, and 57½ the minimum at St. Neots, the magnificent going from Huntingdon through to Hitchin being expressed by the time of 26 min. 35 sec.—only 10 sec. more than that of No. 294 in the first column. At Stevenage we fell to 41 m.p.h. and then, with every prospect of making the terminus in 83 min. from Peterborough—with 440 tons behind the tender!—we encountered a tragic series of signal checks from Woolmer Green to Hatfield, from that wretched one o'clock "slow" from Hitchin, running late. It was most discouraging to our driver, after his magnificent effort, as well as a poor sample of traffic working, that so insignificant a train could not be held back at Knebworth or Woolmer Green (it is booked in any case to wait 28 min. at Hatfield), in order to let this first-class express take the road first. The delay cost us fully 4 min. and translated our real gain of a minute into a loss of 3 min. on arrival. It would not be too much to say that this is the finest Great Northern "Atlantic" run that I have ever been privileged to record.

If this run was a phenomenon, one that I have made since on the same train behind "Atlantic" No. 1452 was a miracle. With a load of about 455 tons from Doncaster to Grantham, and between 490 and 500 tons thence to London, the engine actually dropped only ½-min. on the 156-mile journey. It is now too late to insert all the details in the present issue, but I hope next month to give an adequate appreciation of the work of Driver B. Codd and Fireman Cameron on this astonishing trip.

And now we come to the two up "Pacific" runs from Peterborough. No. 1471 got away finely, with the best time of the whole series to Yaxley, only to get signals so severely on at Holme as to be brought almost to a stand, and this right at the bottom of Ripton bank. On the 1 in 200 we worked gradually up to 45 m.p.h., passed Huntingdon and Offord at 69 m.p.h., St. Neots at 57, Tempsford at 65, Langford at 55½, Arlesey at 62½, Hitchin at 50½ (increasing to 52 on the short "level" through the station), Stevenage at 47, Hatfield at 72½ and Potter's Bar at 52, after which we ran into fog, and finally lost ½-min. on schedule. But the net time was 81 min., 5 min. less than schedule, and made up a total net gain of no less than 11½ min. to engine from Doncaster to London. No. 1470, with the heavier train of the two, had a run that was unchecked in its earlier stages; Ripton bank was surmounted at a sustained speed of exactly 50 m.p.h. on the 1 in 200, after a maximum of 64½ m.p.h. at Holme; then, when we had maintained 69 m.p.h. from Huntingdon to Offord, the engine was clearly eased, and nothing further occurred of note until we were checked

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fairly severely by signal outside Hitchin. This elicited a fast finish from Hatfield, with a maximum of 75 m.p.h. through that town, a minimum of 55½ m.p.h. at Potter's Bar, and a top speed of 70½ at New Southgate, so that we arrived 1¼ min. early, delay notwithstanding. Net time on this trip was 83 min.

Considering the simply fearful weather conditions in which it was made, and which it is impossible to reduce to a basis of figures, it would be unfair to include my only other up "Pacific" run in the table—the continuation of 1470's journey in the third column of the Doncaster-Peterborough table. Along the exposed lengths of the main line, which is for the major part of its length south of Peterborough peculiarly unsheltered from side-winds, the coaches fairly rocked with the tornado that was blowing from the south-west, so that even No. 1470 was overmastered, and with our train now heavily laden to a total of fully 500 tons, we took 55 min. 20 sec. to Hitchin. But with some sheltered lengths from there onwards, we contrived to run on to King's Cross in 35¾ min., touching 67 m.p.h. at Hatfield, falling to 49 at Potter's Bar, and reaching 75 at New Southgate, whereby we ran from Potter's Bar into the terminus in 13 min. 25 sec. The new clock then in progress of installation on the arrival side at King's Cross endeavoured to console the driver by pointing to the hour of 2.5, but the actual time was 2.15 p.m., and we were 20 min. late. But, as I have said already, this was no fair test. In ordinary conditions—if the loading of these enormous trains can so much as be termed "ordinary"—the "Pacifics" are doing with ease all that is asked of them, and in place of that sharp and constant exhaust of the "Atlantics" when hard at work, aptly dubbed by a friend of mine "peppering along," the revolutionary behaviour of the "Pacifics" is perhaps best expressed by the fact that their exhaust is practically inaudible, even from the leading coaches of their trains, except just at starting and at the summits of the steepest inclines.

THE FAMOUS "CORNWALL" IN SERVICE.

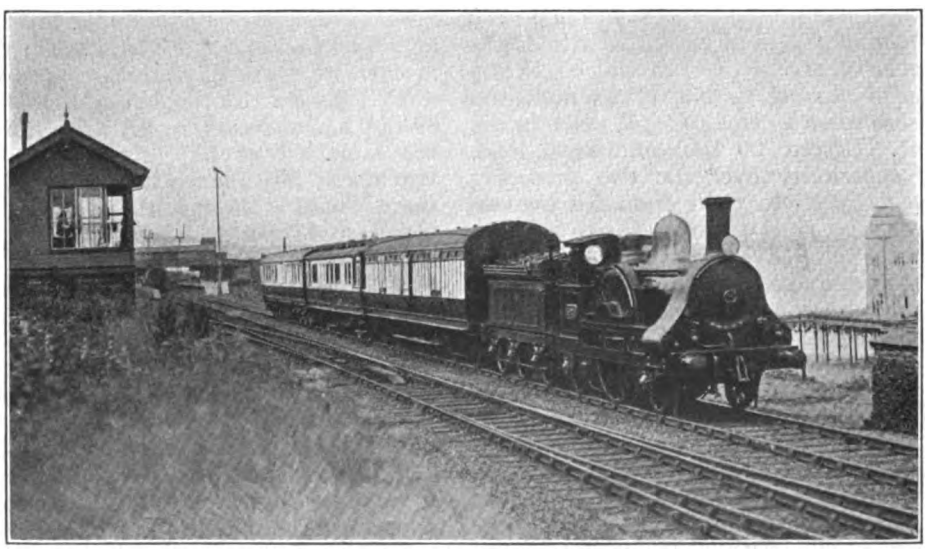

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*H. Gordon Tidey.*

Up Directors' Special Train.

London & North Western 2-2-2 locomotive No. 3020, "Cornwall" (8 ft. 6 in. driving wheels).

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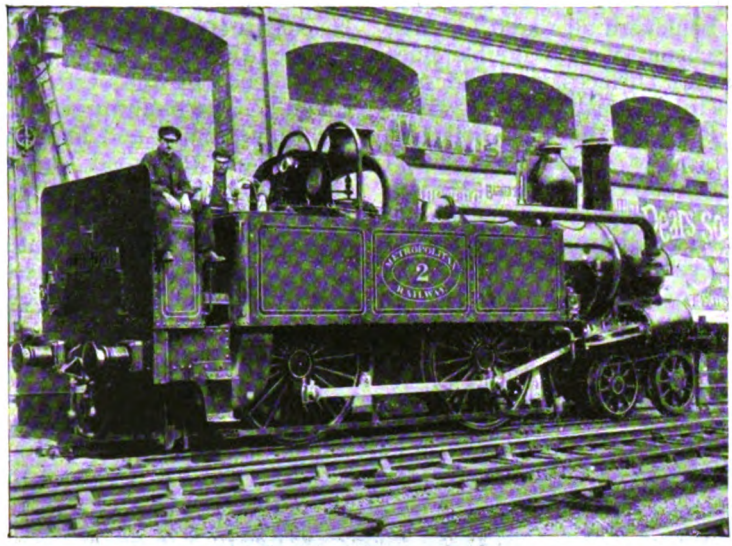

ONE OF THE FIRST STEAM LOCOMOTIVES AS ORIGINALLY BUILT.

Diamond Jubilee of the Metropolitan Railway.

IN the September, 1922, number of the RAILWAY MAGAZINE, Mr. W. Parker dealt so fully with "The Metropolitan Railway: its characteristics and its Methods," that in connection with the Diamond Jubilee celebrated by the Metropolitan Railway on January 10 last, there is no need to repeat the general facts of its history and development, except to emphasise the tremendous differences between the Metropolitan Railway of 1863 and the Metropolitan Railway of to-day as indicated by the following table:—

	1863	1922
Miles constructed..	3¾	93
Paid-up capital ..	£1,405,900	£20,328,758
Passengers carried	9,455,175	180,500,000
Total receipts ..	£101,707	£1,960,000

Attention, may, however, be directed to a "Souvenir" published by the Metropolitan Railway, copies of which can be had at stations, or direct from the Commercial Manager, Mr. J. Wardle, at Baker Street station, price 6d. Included are numerous illustrations, many familiar to readers of the RAILWAY MAGAZINE, but a few, of which a selection is now reproduced, but little known, if not altogether strange. The writer has, moreover, collected a number of facts which help to clear up some of the uncertainties of early Metropolitan Railway history. We therefore give a selection of the more interesting items of a less familiar character.

The dominant idea in the promoters' minds revealed itself in the route selected. It was to link together the northern railway termini, the Great Western at Paddington, the London and Birmingham at Euston, and the Great Northern at King's Cross, and to bring them into touch with the City. For 20 years and more before 1863 various projects had been mooted for establishing physical connection between them and bringing the country lines into close contact with the heart of the City. All sorts of fantastic schemes were started—a scheme for draining the Regent's Canal and transforming it into a railway with wide extensions, a scheme for an overhead

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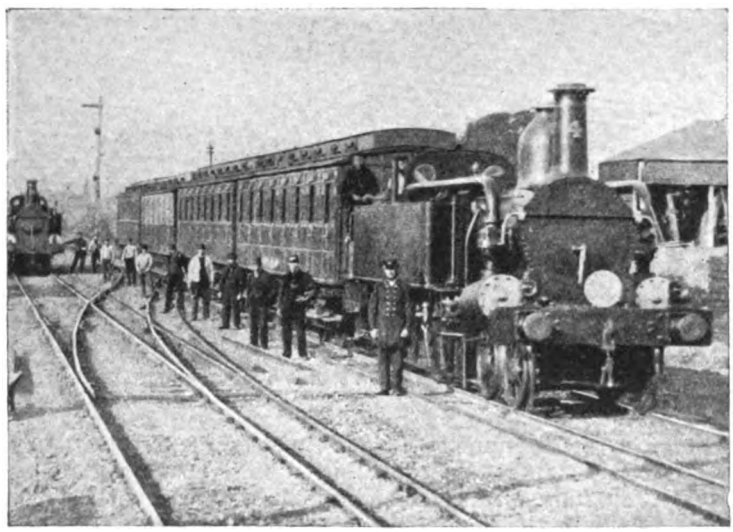
railway on arches, a scheme for a "crystal way," to be covered with glass and combined with a boulevard all round London, and a bold scheme of four double lines under new street surfaces in grand new thoroughfares to the furtherance of which Mr. Charles Pearson, the City Solicitor, devoted for many years his superabundant energy and enthusiasm. He was the real founder, though by no means the only begetter, of the Metropolitan Railway, but the plan eventually adopted was but a pale shadow of the stupendous under-



AN EARLY TRAIN AT HAMMERSMITH, SHOWING BROAD AND NARROW GAUGE.

taking to gain support for which he held scores of public meetings and wrote voluminously to the public press.

The moment was opportune. The City Cattle Market was about to be removed to Islington, thus leaving a vacant space, suitable for a railway terminus. That is the reason why Farringdon Street came to be the original terminus of the Metropolitan Railway, after the original project of the City Railway Terminus Company had come to nought, and the North Metropolitan Railway Company entered the field with a different scheme and with the benevolent support of the Great Western Railway.

The outstanding feature of the proposals of the new company was that the strip of railway which they had in mind should be constructed without permanent interference with private property or public convenience by the system of "cut and cover." The roadway was to be dug up, the tunnel made and lined with belts of brick, and the road surface restored. Other schemes had involved a sunken railway open or partly open to the sky, which would have aggravated the noise and grime of the districts traversed. The North Metropolitan Company, in the face of bitter opposition, carried its Bill through Parliament. It was objected by interested parties that its tunnel must collapse and fall in owing to the transverse pressure exercised by the weight of the adjoining buildings; that the continuous vibration would render the houses above quite uninhabitable; that passengers would be asphyxiated by the noxious fumes, and that it would be impossible to run trains at five minute intervals without frequent collisions.

The Metropolitan Railway was not brought easily to birth. Money was difficult to raise. Trouble arose first with the Great Western and then with the Great Northern Company. The City

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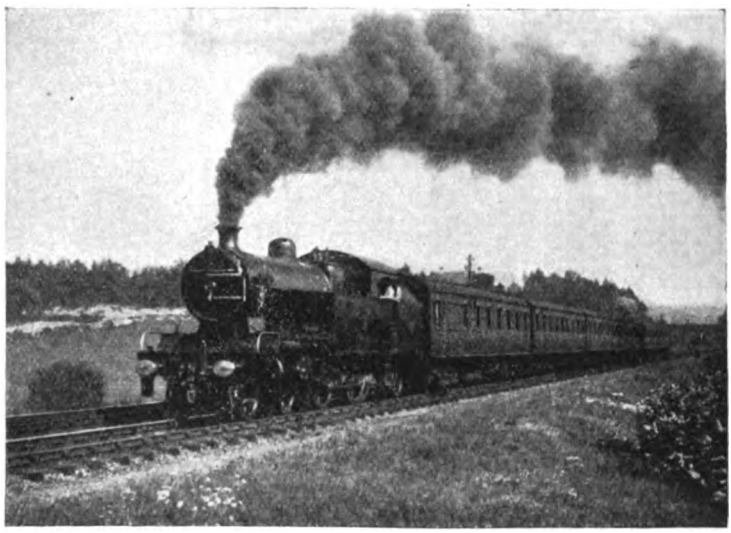
of London drove a hard bargain in return for its subscription of £200,000 and many of the demands for compensation were most extravagant and exorbitant. But when Pearson came on the scene again his energy drove things through, and the actual construction of the line was completed in about two years and a half, a very creditable performance considering the net-work of sewers, gas-mains and water-mains through which the tunnels had to be driven. The bursting of the Fleet Ditch Sewer in June, 1862, caused enormous damage in Farringdon Street and filled the tunnel 10 ft. deep as far as King's Cross, but this was the only serious check to the steady progress of what was justly considered at the time a magnificent engineering feat.

Old illustrations, including one reproduced on page 173, of the September, 1922, RAILWAY MAGAZINE have, not unnaturally, given rise to a popular misconception, that the earliest passengers rode in open trucks. This applied only to trial trips, and the first public trains had first, second and third-class carriages, which were judged to be "extremely handsome and roomy vehicles," the first-class being "luxuriously" fitted up, and the third declared to be incomparably superior to those of any other railway in the land. Moreover, they were lit by gas instead of oil lamps, the gas being carried in long india-rubber bags covering the roof of each carriage. In this respect also, the Metropolitan was a pioneer, and passengers were said to find the carriages so bright as utterly to remove all sense of travelling underground.

On the very first day the directors realised that one of their chief problems would be how to cope with the homeward rush when the day's work was done, for the crush round the approaches at Farringdon Street was compared to the crush at the pit-door of a popular theatre. More than 30,000 people were carried that day, and the traffic for the first three weeks gave an average of 29,196 a day, with receipts of £346 7s. 6d. The directors, therefore, striking while the iron was hot, lost no time in appealing for fresh capital in order to push on with the extensions which they had in mind, and, feeling secure, as they had every right to do, of the appreciation of the London public—for their fares were low compared with the prevailing omnibus fares, and their speed of transit was as 12 miles an hour to 7—



A MODERN STEAM TRAIN NEAR AMERSHAM.

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a probable return of 15 per cent. was, therefore, confidently spoken of, though these rainbow hopes were never realised.

But in spite of severe financial difficulties the Metropolitan Railway steadily progressed. The junction with the Great Northern was completed in October, 1863, when Great Northern trains started running to Farringdon Street. In 1864, the Hammersmith line opened with broad gauge trains running from Hammersmith to Shepherd's Bush, Notting Hill and Westbourne Park, and so on to Bishop's Road and the City. In the following year the Metropolitan had pushed through to Moorgate Street. In 1867, the Hammersmith and City Line was vested in the Great Western and Metropolitan Companies. In 1868, new links were added, for the Western Metropolitan extension was opened from Edgware Road to South Kensington, and the District opened from South Kensington to Westminster Bridge; a junction with the Midland was effected at King's Cross; and the way was made smooth for the future extension of the Metropolitan into the country by the opening of the St. John's Wood Railway from Baker Street to Swiss Cottage. Almost simultaneously with the opening of this line, the first train began to run on the Aylesbury and Buckingham Railway though the directors of neither company could have had any idea that their lines were destined to be joined together in the days to come.

By 1870, the opening of the Metropolitan District line from Westminster to Blackfriars left only the short gap to be completed from Blackfriars to Moorgate Street, and this was further reduced in the following year by the District extension to the Mansion House. The completion of the last link, however, was delayed several years by acute conflict of will between the Metropolitan and the District Companies, and so it came about that before the Inner Circle was finished in 1884 the St. John's Wood Railway had long since been taken over by the Metropolitan, and the St. John's Wood and Harrow Extension Line, as it was called, had safely reached Harrow and was joyously stretching forward to Pinner (1885) and Rickmansworth (1887). Sir Edward Watkin carried his lines to Chesham (1889) and to Aylesbury (1892) after taking over the Aylesbury and Buckingham Railway in the previous year and doubling its tracks. In the 22 years

TRIAL TRIP OF FIRST "METRO." ELECTRIC TRAIN.

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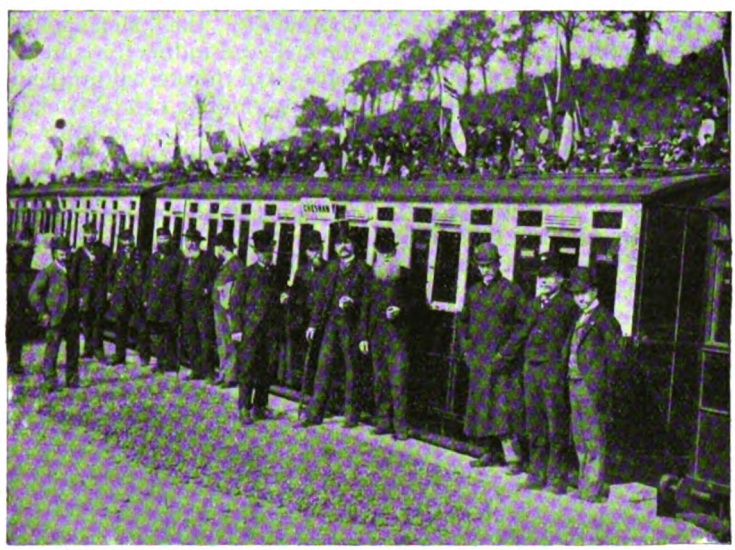
of Sir Edward Watkin's *regime* he succeeded in doubling the volume of traffic from 44,392,000 passengers in 1872 to 88,513,000 in 1894.

It is interesting to recall that for many years the Metropolitan Railway ran services of omnibuses between selected points, in order to supplement its train facilities for the convenience of passengers. As far back as 1866, Metropolitan omnibuses ran between Great Portland Street and Oxford Circus, and afterwards to Piccadilly Circus, where a Metropolitan booking-service from St. John's Wood Road, *via* Westbourne Grove, to Piccadilly Circus. The best remembered of these old 'buses were those which plied between Gower Street and Edgware Road, viz., Oxford Street and Marble Arch. But they are all gone now, and even their memory is fading fast.

There is no need to repeat the story of electrification and the introduction of automatic signalling, in regard to which the Metropolitan Railway was a pioneer, It will be sufficient to mention that on



OPENING OF CHESHAM BRANCH LINE.

office was for many years maintained. The 'buses at first had two compartments (first and second), and the larger ones were drawn by three horses. All were distinguished by a large red umbrella over the box seat, which defied wind and storm. First-class accommodation ceased to be provided in 1882, and Metropolitan Railway tickets ceased to be available on the 'buses in 1889. The routes were frequently changed according to the pressure of competition and the growth of localities, but it is worth mention that even after the first "Vanguard"—the famous No. 1—had started running from Brondesbury to the Law Courts, the Metropolitan valiantly started a new horse omnibus

January 1, 1905, electric trains began running regularly from Baker Street to Uxbridge, and six months later an electric service was introduced on the Inner Circle from Aldgate to South Kensington. The travelling public gained enormously by the change. It gained, for example, in time, for the round of the Inner Circle was completed in 50 min. instead of 70 min. It also gained immeasurably in comfort through the purging of the tunnels of the sulphurous fumes which, however wholesome they might be, were certainly not palatable, and by the removal of the grimy deposits which hung thick upon the walls. The old rolling-stock, with its narrow cramped compartments, gave way

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to long and brilliantly lighted corridor coaches, and the general impression of the Londoner was that he had come into possession of a brand new Metropolitan.

At the outset, the too sanguine expectations of an immediate increase of 30 to 50 per cent. in the number of passengers were not realised; but it is fair to remember that when Colonel Mellor, then Chairman of the Company, made that prophecy the motor omnibus had not yet established itself upon the streets and its immense development was only discerned vaguely by enthusiasts through the mists of optimism. It is an interesting fact, however, in the history of London transport that the No. 1 Vanguard service started virtually simultaneously with the electrification of the Metropolitan and the introduction of automatic signalling.

A new era had begun, and has not even yet reached its zenith. Other items of special interest were the widening and four-tracking of the Finchley Road-Wembley Park section, and the rebuilding and enlargement of Baker Street station, associated with the General Managership of Mr. R. H. Selbie, C.B.E. Also the acquisition of the Great Northern and City Railway and the electric working of the East London Railway by the Metropolitan Company. The new line to Watford, now under construction, may also be mentioned.

It will therefore be seen that the Metropolitan Railway has played a foremost part in working out a smooth solution of two of the most difficult as well as most formidable problems of everyday existence in a great capital city—the problem of cheap, rapid, continuous and safe transport and the problem of enabling a large proportion of urban workers to make their homes in the inner and outer suburbs, and sleep in a purer atmosphere than that in which they earn their daily bread. Moreover, through one of its associated companies, the Metropolitan is both directly and indirectly contributing to the solution of the eternal problem of London's housing, and it can also claim the credit of being the first railway company, by means of cheap fares and books of walks, to encourage the Londoner to explore for himself the more retired beauties of the fields and bypaths of the exceptionally beautiful country so near to London, particularly in the north-western direction. The Metropolitan Railway lives up to a great name; it acts up to a noble motto; it looks forward to a more splendid future.

ON THE CANADIAN PACIFIC RAILWAY.

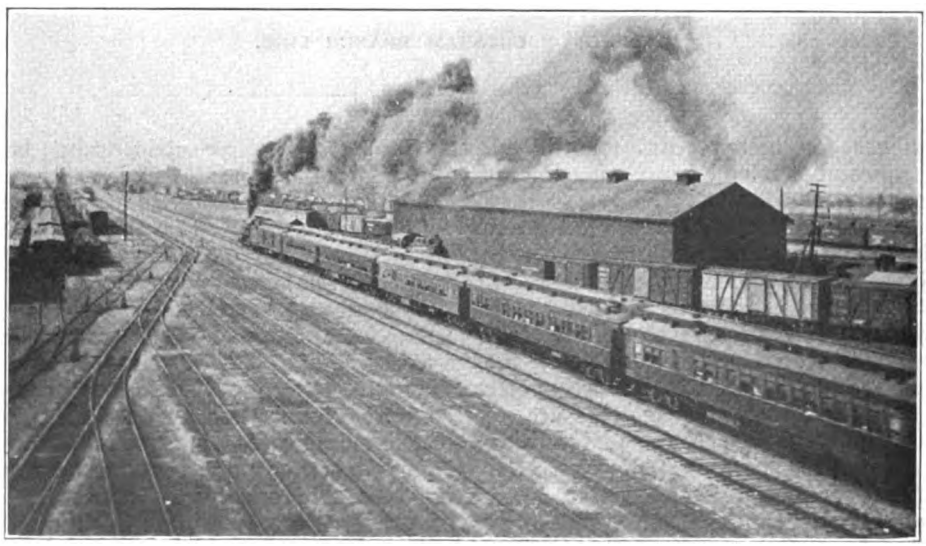

Photo.] "BEACH SPECIAL" TRAIN LEAVING WINNIPEG. [*Norman Thompson.*

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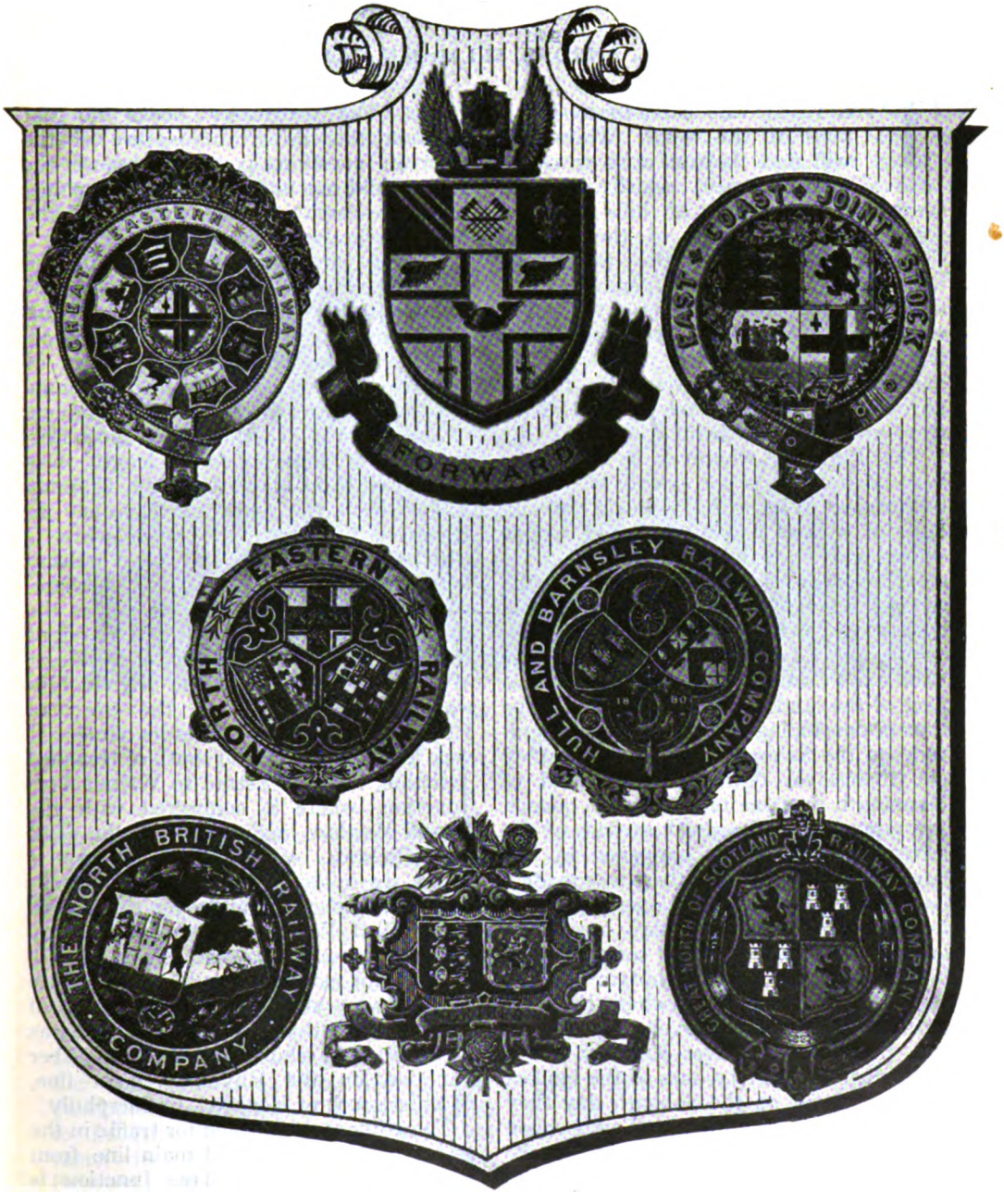
LONDON AND NORTH EASTERN RAILWAY.

ARMS OF THE CONSTITUENT COMPANIES.


GREAT EASTERN RAILWAY
FORWARD
EAST COAST JOINT STOCK
NORTH EASTERN RAILWAY
HULL AND BARNSLEY RAILWAY COMPANY
THE NORTH BRITISH RAILWAY COMPANY
THE GREAT NORTH OF SCOTLAND RAILWAY COMPANY

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Locomotive and Train Working in the latter part of the 19th Century.

THE RHYMNEY RAILWAY. [No. 1.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE reader who cares to consult a map of the South Wales area will find thereon a river called the Rumney, which has its source in the range of hills situated some 25 miles north of the Bristol Channel, and forming the water-shed upon which Dowlais is perched. The source of the river is only a few miles north-east of Dowlais, and the stream flows down one of the many parallel valleys of this district, eventually finding an outlet into the Bristol Channel about three miles east of Cardiff.

The Rumney, whatever it may have been in the past, is not exactly what may be termed a beautiful pellucid stream. Most of it is of a dirty brownish yellow colour, but, nevertheless, it has its uses, chief amongst which is that it forms the geographical boundary between the English county of Monmouth and the Welsh county of Glamorgan. Amongst the habits and customs of the dwellers in this part of the land of Glamorgan used to be that of developing a thirst of great magnitude on the Sabbath day, wherefore they got themselves down into the land of Monmouth in great multitudes to quench the same in the cheerful hostelries of the latter county. For it happened in the land of Glamorgan that there was made a law which prohibited the opening of the hostelries on the Sabbath day, but in the land of Monmouth a weary searcher after liquid refreshment could obtain his fill, provided that he was what the law termed a "bona-fide traveller." To this end, therefore, the river Rumney was a godsend to the thirsty ones of the land of Glamorgan, for on the Sabbath day they crossed the river, and, like Cæsar when over the Rubicon, proceeded to "make hay" on the other side. Once over the Rumney the inhabitants of Glamorgan became "bona-fide travellers," and their number on the Sabbath day was exceeding great. The geography books do not mention this important feature of the river in question, possibly because the authors did not make a sufficiently painstaking research into the customs of the natives who dwelt near its banks.

Having introduced the river to the notice of your readers, I will now connect it up with the railway. Away back up the Rumney, a few miles from its source, lies the mining and ironworks town of Rhymney, which desired to find some convenient outlet for the mineral products of the district. To this end a short railway, about nine miles in length, was authorised to be made down the Rumney Valley from the town of Rhymney to Hengoed Junction. The latter place is situated on the east and west railway between Pontypool Road and Aberdare, which at that time was an offshoot of the old Newport, Abergavenny and Hereford Railway, but now forms part of the Great Western system. From the original railway, as projected from the town of Rhymney, the railway takes its name. It was, however, continued south of Hengoed Junction, through Ystrad to Walnut Tree Junction, where it connected with the Cardiff-Merthyr main line of the Taff Vale Railway. Walnut Tree Junction is about six miles north of Cardiff (Crockherbtown Junction), and over this length of the Taff Vale the Rhymney Railway obtained running powers. From Crockherbtown it made its own line to the Bute East Docks at Cardiff, a distance of slightly more than $1\frac{1}{4}$ miles. There was in addition a short branch from Aber Junction on the Rhymney main line, $5\frac{3}{4}$ miles south of Hengoed, to Caerphilly.

These lines were opened for traffic in the spring of 1858. The old main line from Rhymney to Walnut Tree Junction is about $18\frac{1}{2}$ miles long, and runs down the Rumney Valley on the Glamorganshire side of the river. It may be added that

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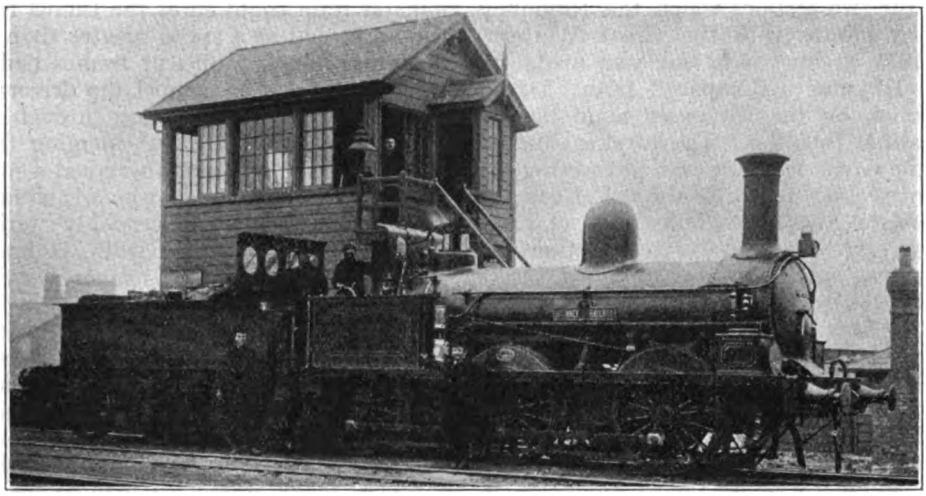
there is another railway which runs up the same valley, but on the Monmouthshire side. This is the "Old Rhymney" branch of the Brecon and Merthyr Railway and has already been mentioned in connection with the latter. The Rhymney Railway continued to work its trains to Cardiff Docks via Walnut Tree Junction and the Taff Vale main line until April, 1871, when a new direct line to Cardiff was opened from Caerphilly through Llanishen. From this date the Rhymney became independent of the Taff Vale. The former branch from Aber Junction to Caerphilly became part of the present main line, the distance from Rhymney to Cardiff Docks being reduced to 23¾ miles, the whole of which belonged to the Rhymney Railway. The old portion of the main line between Aber Junction and Walnut Tree Junction became a mere branch connection, over which the Rhymney worked a few mineral trains destined for Penarth Docks (Taff Vale Railway). These trains ran over the Taff Vale main line from Walnut Tree Junction for a distance of about two miles to Penarth Junction, where they were taken over by the Taff Vale Railway. Between Penarth Junction and Cardiff the Rhymney ceases to use the Taff Vale, the running powers over this section having been discontinued.

For a proper understanding of the various ramifications of the Rhymney Railway certain other branches must be mentioned. At Bargoed, on the original main line, between Hengoed and Rhymney, and about 5¾ miles south of the latter station, a short branch was opened in 1865 to Deri. This leaves the main line in a north-westerly direction, and is about two miles long. At Bargoed the Brecon and Merthyr main line from Newport joins the Rhymney Railway and the Brecon and Merthyr main line trains to the north used this two-mile branch of Rhymney line to Deri, where they entered their own territory again. As a result, the Deri branch was used more by the Brecon and Merthyr than by the owning company. The passenger service was provided by the Brecon and Merthyr, but the Rhymney worked a number of mineral trains to Deri and thence over the Brecon and Merthyr to Fochriew sidings.



0-6-0 GOODS ENGINE, No. 1.

Built by Vulcan Foundry Co. 1857; rebuilt at Cardiff.
Coupled wheels, 4 ft. 8 in. diam. Cylinders, 16 in. by 24 in.

Finally there are the lines owned jointly with other companies. North of Rhymney the main line was extended for a distance of 1½ miles to Rhymney Bridge, where it joined the London and North Western cross-country line from Abergavenny to Merthyr. The line between Rhymney and Rhymney Bridge, and also the portion of the London and North Western route

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thence in the direction of Abergavenny as far as Nantybwch, 2½ miles east of Rhymney Bridge, was the joint property of both railways. The Rhymney Company's passenger trains to and from Cardiff ran through to Rhymney Bridge, but the passenger service thence to Nantybwch was provided by the North Western. The Rhymney worked certain mineral trains to Nantybwch. The London and North Western used the whole of the Rhymney main line from Rhymney to Cardiff for through goods trains only.

But the most important of the joint lines are the two sections which the Rhymney owned jointly with the Great Western. In 1871 a short loop line was made by the Rhymney Company from Ystrad Junction on the Rhymney main line to Penalltau Junction. The latter is situated on the Great Western east and west cross-country line from Pontypool Road to Aberdare, about two miles west of Hengoed. By means of this connection the Rhymney mineral trains obtained access over the Great Western to Middle Duffryn in the Aberdare district, and thus began to compete with the Taff Vale for coal traffic thence to Cardiff Docks. From Llancaiach Junction, one mile further west of Penalltau Junction, on the same Great Western line, the two companies made a joint railway running almost due north to Dowlais. This was opened in 1875, and like some of the other railways running up the parallel valleys has a long upward gradient of 1 in 40 to 1 in 43 for about seven miles. It was known as the Bargoed Joint Railway, the distance from Llancaiach Junction to Dowlais station being 9½ miles. Both companies worked their own mineral trains over this line. The passenger trains which ran to Dowlais (Cae Harris) were termed "joint" in the time-tables, but were, as far as my recollection goes, mostly worked by the Great Western.

Up the next valley westwards, a very important joint line was made from Quaker's Yard, also on the same Great Western line, to Merthyr, a distance of nearly seven miles. This railway, opened in 1886, again brought the Rhymney Company into competition with the Taff Vale Railway, and a service of through passenger trains between Merthyr and Cardiff was introduced. These trains were worked by the Rhymney Railway.

Most of the early main line locomotives built between 1857 and 1869 were tender engines, as on the Taff Vale Railway, but the Rhymney discarded tender for tank engines long before the Taff Vale did so. Generally speaking, the gradients on the main lines to Rhymney and to Merthyr are heavier than those of the Taff Vale, and one never saw on the Rhymney Railway any coal trains without brake vans. In fact, the regulations for working down trains to Cardiff through the Caerphilly tunnel were very stringent. No goods or mineral train could enter the tunnel from the north end at a speed greater than six miles per hour. Sufficient brakes had to be pinned down to compel the drivers to use a little steam in passing through the tunnel, but the speed on emerging from the south end was not to exceed 4 miles per hour. This tunnel, which is situated about ¾ mile south of Caerphilly station, on the main line to Cardiff, is 1 mile 176 yards long, and is the heaviest engineering work on the line.

There were six tender goods engines, Nos. 1 to 6, of the 0-6-0 type with inside frames. These were built by the Vulcan Foundry of Newton-le-Willows, Lancashire, in 1857, and had 4 ft. 8 in. wheels and 16 in. by 24 in. cylinders. No. 1 of this class is illustrated. It will be noticed that the tenders were supplied with weather boards to protect the men when running tender first.

The remaining goods tender engines had double frames and outside cranks and were designed and built in 1859-1868 by Messrs. Kitson & Co., of Leeds. Of these Nos. 12 to 15 had 4 ft. 3 in. coupled wheels and 16 in. by 24 in. cylinders. No. 15, as I remember it, had been rebuilt as a saddle tank engine in 1884, but the other three retained their tenders.

Nos. 19 to 22 were also by Kitson & Co. in 1868, but had all the wheels in front of the firebox, the boilers having very long barrels. These had 4 ft. 4 in. wheels and 16½ in. by 24 in. cylinders. An illustration of No. 21 of this class appeared in the RAILWAY MAGAZINE, December, 1912, page 478, and for particulars of them and also of some interesting reminiscences of the Rhymney Railway in 1868, the reader is recommended to refer to "Leaves from

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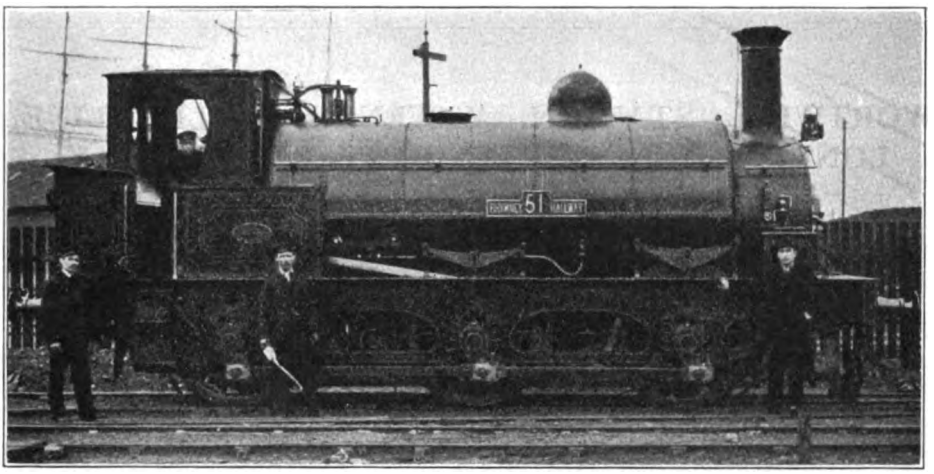
the Log of a Locomotive Engineer," by the late Mr. Robert Weatherburn, which appeared in that number.

There were also four tender passenger engines of the 2-4-0 type, with inside frames. These had been built by the Vulcan Foundry, Nos. 7, 8 and 9 in 1858, and No. 16 in 1861. They had 5 ft. 3 in. coupled wheels and 16 in. by 20 in. cylinders, and worked the passenger service between Cardiff and Rhymney. They were rebuilt in 1880–1 as tank engines, and will again be referred to when the passenger train services are mentioned.



R. E. Bleasdale] **0-6-0 SADDLE-TANK ENGINE, No. 51.** [*Warwick.*

Built by Sharp, Stewart & Co., Ltd., 1884.
Coupled wheels, 4 ft. 7½ in. diam. Cylinders, 17½ in. by 24 in.

Perhaps the most interesting part of the Rhymney Railway was the late Mr. Cornelius Lundie, who was General Manager for more than 40 years, and one of the most remarkable railway personalities of the last century. One cannot mention the Rhymney Railway without associating Mr. Lundie with it, for it might be said, without great exaggeration, that Mr. Lundie was the Rhymney Railway Company, and that the Rhymney Railway Company was Mr. Lundie. He might be described as the Rhymney "Pooh-Bah," but he considerably outdid that celebrated character by being not only "Lord High Everything Else," but Lord High Executioner, Mikado, Chorus and Band all rolled into one. Presumably he was the "General Manager," but he was also the Traffic Manager and Superintendent of the Line. Further, if you consulted Bradshaw, or a railway directory, you also discovered that Mr. Cornelius Lundie was the Chief Engineer, and that the Chief Locomotive Superintendent was also named Cornelius Lundie. He may have also been chief ticket collector, but when I visited Cardiff station I was disappointed to find that he was off duty for the time being in that capacity, and that an inferior being was deputising for him. He boosted up the staff generally, and may possibly have even put the postage stamps on the envelopes of the company's correspondence, in addition to filling various other functions connected with the well-being of a fair-sized railway.

But apart from all this, Mr. Lundie was a marvellous old man, and he lived absolutely for the Rhymney Railway, the welfare of which was everything in life to him. In 1904, at the age of 89, after more than 40 years' service as General Manager, he nominally retired from that position, and a grateful Board very naturally elected him a director. But if report is to be believed, the change was somewhat more nominal than real, and the old gentleman continued to do a good deal of "general managing" as before, and

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was in regular attendance at the head offices. Two days before he passed away, at the age of 93, he was to be seen at his old headquarters. It may truly be said that there has hardly been any railway official like him, except perhaps Mr. Brassey, who, many years earlier, had practically owned and run the old Shrewsbury and Hereford Railway on somewhat similar lines.

From 1872 onwards all the later Rhymney locomotives except one were of the saddle-tank type. Those for goods and mineral traffic, until 1884, were of the 0-6-0 type with double frames and outside cranks. The coupled wheels were 4 ft. 7 in. diam. Nos. 23 to 32, by Sharp, Stewart & Co., 1872, and Nos. 33 to 38, by Nasmyth, Wilson & Co., 1874–5, had 16 in. by 24 in. cylinders, and Nos. 39 to 44, by Stephenson & Co., 1878, had 16½ in. by 24 in. cylinders. In the last 12 engines of this type, Nos. 45 to 56, built by Sharp, Stewart & Co. in 1884, the cylinders were enlarged to 17½ in. by 24 in. The illustration of No. 51 is practically similar to the whole series, Nos. 23 to 56.

(*To be continued*).

WORTWELL STATION, WAVENEY VALLEY LINE, LONDON AND NORTH EASTERN RAILWAY.

THE photograph reproduced (kindly supplied by Mr. H. D. E. Rokeby) shows one of two disused stations on the Waveney Valley section of the late Great Eastern Railway. Both are situated between Harleston and Homersfield stations, one being at Wortwell and the other at Redenhall. It is somewhat remarkable that two such stations should be found within so short a distance, especially in conjunction with the fact that we have not been able to substantiate that either was ever brought into use, although station buildings and a practically completed platform are available in each case. The Waveney Valley section was opened from Tivetshall to Harleston, December 1, 1855; to Bungay, October 2, 1860; and Bungay to Beccles, March 1, 1863. The Waveney Valley Railway was amalgamated with the Great Eastern Railway as from March 1, 1863.

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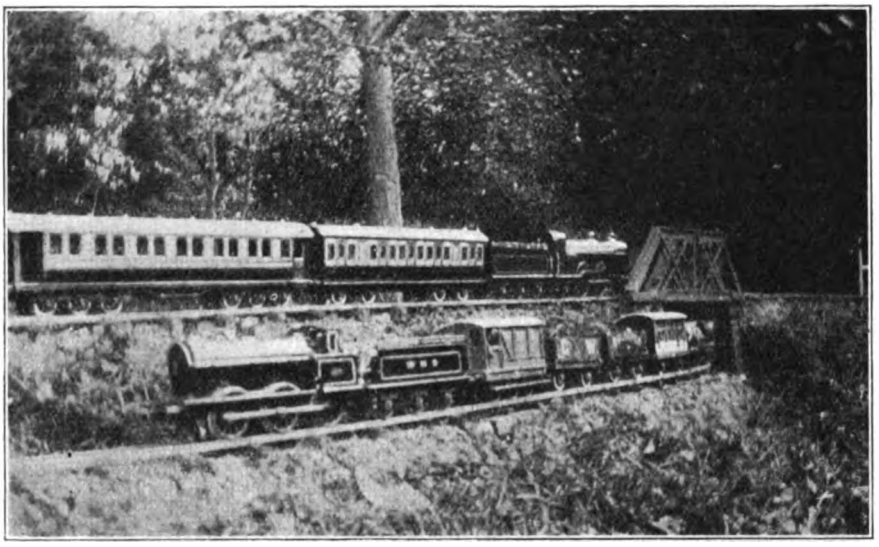

BURROWING JUNCTION NEAR "LABURNUM HILL."

A Notable Out-door Model Railway.

By W. G. HUNTER.

A SHORT time ago, owing to the publication of paragraphs and illustrations in certain newspapers and, more recently, through the exhibition of a film, attention was called to a small model railway in the vicarage grounds at Walberton, Sussex. The writer, who was responsible for its construction, was quite unaware, when he arranged for it to be on view at the local "Flower Show" last summer, that what had been a pleasant recreation for some spare moments would attract such notice; still less was he prepared for the suggestion that he should describe the model for the benefit of the readers of the RAILWAY MAGAZINE. In attempting the task, however, he would say at the outset that he makes no claim to possess expert knowledge of engineering, neither does he pretend to have accomplished anything novel in building this miniature line; and any merit it possesses must depend upon its accuracy in reproducing upon a small scale the actual conditions of a full-size railway.

The writer's interest in railways and their working goes back to boyhood days; he remembers the dissatisfaction he felt with the crude representations of rolling-stock to be found in toyshops of the period and his endeavours to model in cardboard something more like "the real thing." Early tastes, though dormant, remained, but time and opportunity for model engineering did not present themselves for many years.

It was in the spring of 1910 that a boy cousin of the writer's came to spend several months with him, and this visit actually led to the building of the railway The purchase of a cheap clockwork locomotive, with coaches and rails in the smallest gauge, started operations. Upon the weather improving, the line was transferred to the garden. A few simple accessories in wood were made, and then, in due course followed the acquisition of some scale model stock.

The railway was developed further the next summer in order to form a "side-show" at a garden fête. It was found before long that the 1¼ in. gauge had its limitations for outdoor purposes, and a change was made to 1¾ in. (No. 1 gauge),

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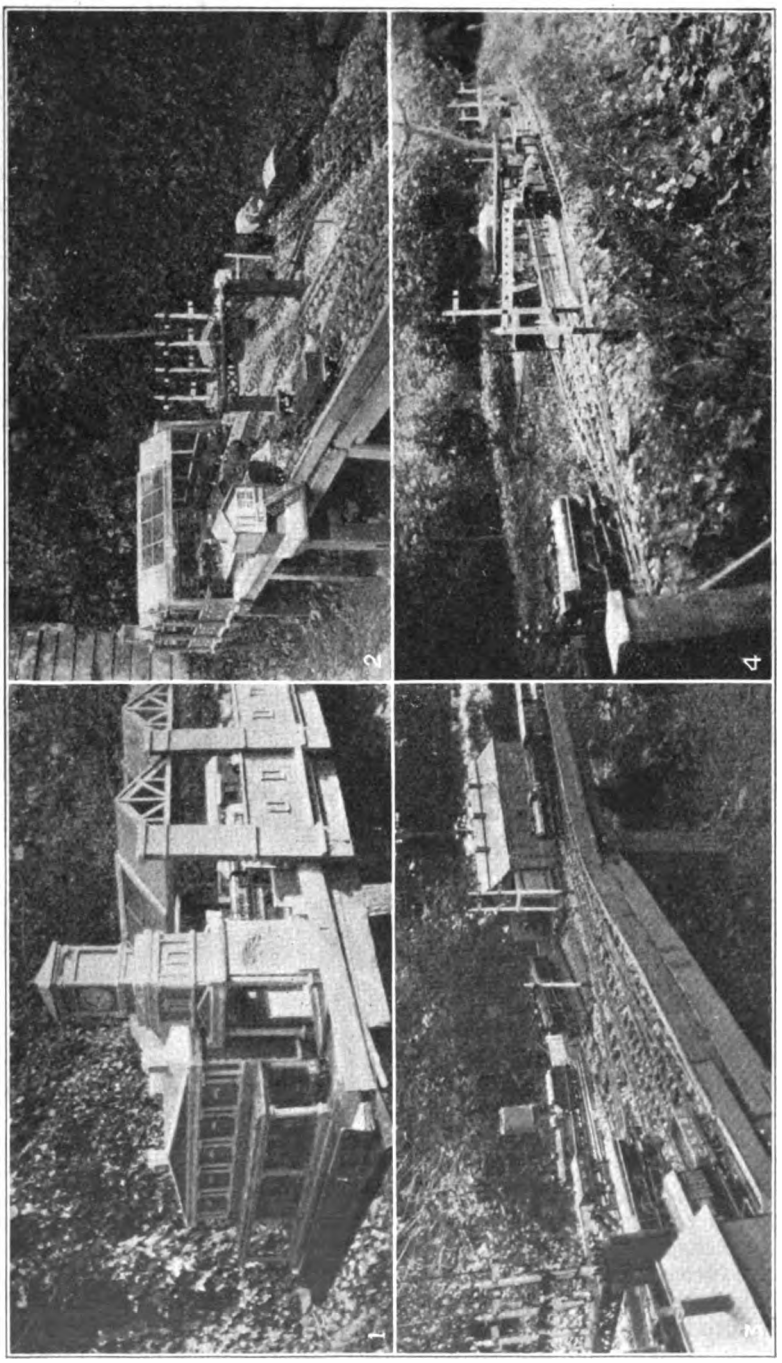

1. GENERAL VIEW OF "NORTHEND" TERMINUS.
2. ANOTHER VIEW OF "NORTHEND" TERMINUS.
3. ENGINE SHED, &c., OUTSIDE THE TERMINUS.
4. "HIGHBANK" JUNCTION.

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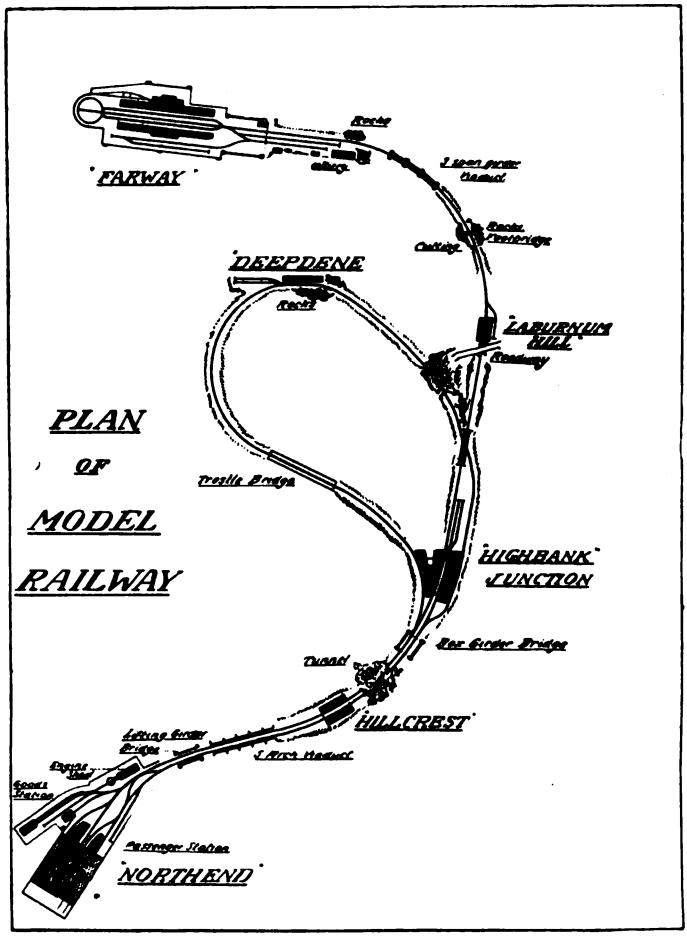
as being likely to provide scope for more ambitious designs. The old stock was disposed of, and a clockwork scale model of a London & North Western "Precursor," with some tinplate coaches, was purchased.

Then began the construction, not only of stations, but of wagons and other goods rolling-stock, and the gradual acquisition of locomotives, chiefly of Great Northern Railway type, all, with one exception, clockwork driven. The railway was extended slowly until finally it consisted of a main line arranged as a loop of about 50 ft. and a short branch, possessing in all four stations.

Improvements made from time to time included the laying of rustless steel track in place of the earlier brass or tinplate rails. Then, in 1915, when the railway had reached a fairly complete state, a change of residence caused the whole of it to be uprooted and everything had to be packed up and removed.



For several years all remained in store, but in 1919 the first step in the construction of the present railway was taken. Experience having proved the advantages of a raised line, some disused woodwork was employed to form a solid foundation, 2 ft. above ground level, and upon this the first stages of the railway were laid. Embankments were constructed gradually and the length of the line extended until it reached a distance of 120 ft., with a loop-line of about 70 ft. in addition.

There are now six stations; the chief terminus, "North End," being the most elaborate. It possesses four tracks, with platforms 7 ft. 6 in. in length, and one of these is sufficiently wide to admit of a roadway for vehicles; there is a siding for spare coaches outside the station. Upon the "down" side of the terminus lies a goods yard with four roads, and one of these connects with a line to the turntable and engine shed. The latter has accommodation for four locomotives and there is space for others outside. The yard is equipped with goods shed and office, water-tank, coal stack, cattle pen and loading gauge. An eight-armed signal gantry is placed near the approach to the passenger station; the signals are operated from the adjacent cabin, which contains 12 levers. The goods yard and the route to the down passenger platforms are protected by the appropriate signals.

In describing the terminus, mention should be made of the somewhat ornate two-storey station buildings, in imitation of red brick with stone facings; there is a pillared portico and a clock tower over the carriage entrance. The platforms and

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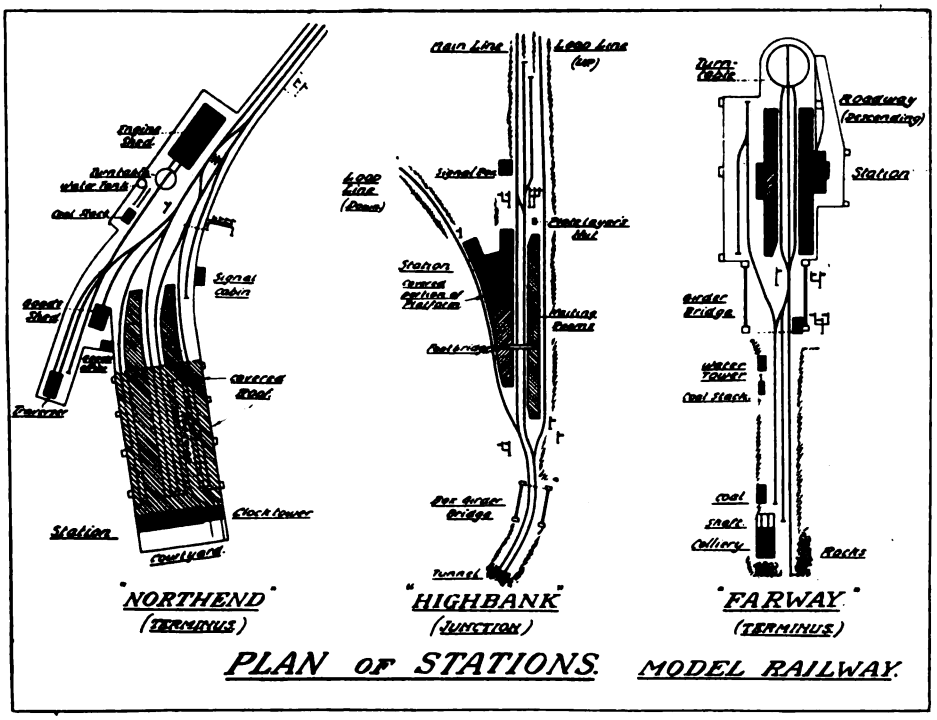
circulating area are partly covered by a glazed roof of three spans, supported upon red brick piers.

Upon leaving the terminus and passing the engine shed upon the left, the line, consisting of up and down roads, runs across a girder bridge (which is made to lift) and then proceeds over an imitation grey stone viaduct of five arches. Just beyond is the small wayside station of "Hill Crest," possessing up and down platforms, each with a shelter to protect "waiting passengers from the elements." At Hill Crest the line plunges into a tunnel (6 ft. 6 in. long) under a rocky eminence and, after emerging, travels a few feet further and then crosses a box girder bridge to reach "Highbank Junction," where the loop line branches off to the left.

There are four roads with platforms here, and the station buildings, constructed, like those of the terminus, in imitation of red brick and stone, are situated in the fork of the down platform between the main and branch lines. There are waiting rooms on the up platform, and a footbridge connects the two platforms, each of which is partially roofed. A signal cabin is placed at the south end of the station, and from here the points and signals are worked. There are two sidings also. The main line becomes single after leaving this station and runs almost straight upon an embankment for about 24 ft.; it passes over the up loop line by a girder bridge and continues a short distance further until it is crossed by a roadway bridge. It then enters "Laburnum Hill," a station having a platform with offices and awning and possessing a siding. From Laburnum Hill the line, still raised upon an embankment, proceeds some way in the same direction, passing through a rocky cutting (crossed by a foot bridge), and bends sharply to the left and runs over a deep depression in the ground by means of a three-span viaduct 9 ft. long, the girders resting upon stone-coloured piers; this, like the other buildings of the line, is constructed entirely of wood, painted.

Beyond the viaduct are further rocks, and, upon the left-hand side, a colliery with sidings, a coal stack and water tower are passed, and then the entrance to



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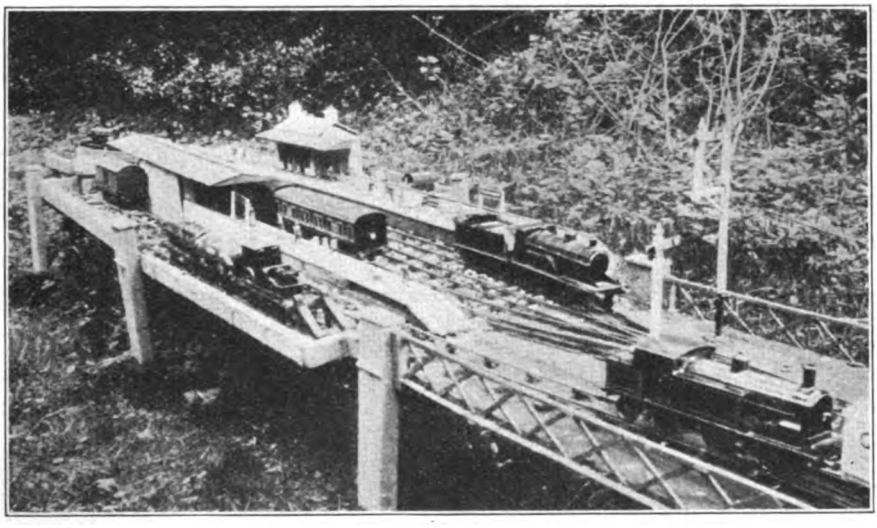
"Farway," the end of the main line, is reached. This station has two platforms, with a third road in the centre, each line of rails converging upon a turntable, so that locomotives can reverse and return to the other end of a train standing at the platform. The booking office, on the "up" side of the line, is approached from the ground level by a sloping roadway; each platform has a shelter. This station, like the other terminus, is supported upon wooden piers, painted stone colour; the buildings represent white rough cast, with woodwork painted green and white, as is the case with several other stations. The entrance to Farway is upon a girder bridge, and at one end of this is the cabin from which the signals are operated; there is a double siding, with traverser, behind the "down" platform.

The branch line before-mentioned leaves the main line at High Bank Junction, and it descends sharply after passing through the station, crossing a trestle bridge 10 feet in length and bending to the right to enter "Deepdene," a station with a single platform on the curve and a double gabled station building. Passing on, still upon the curve, the line gradually straightens, and then enters a short tunnel; after leaving this it runs under the main line and rises by degrees until it returns to the junction. It should be said that trains on the branch line travel in one direction only. The whole length of the railway, as has been intimated, is raised above the ground level, but the main line sinks slightly after passing Hill Crest and is somewhat lower at its extreme end.

Reference has been made already to the rolling-stock, the whole of which is to scale. The locomotives number 11, and, with three exceptions, they are in the livery of the Great Northern Railway; they comprise two G.N.R. "Atlantics," G.N.R. 4-2-2 Ivatt single, G.N.R. 4-4-0 (No. 1373), G.N.R. 4-4-0 (older model repainted), L. and N.W.R. six-coupled goods, G.N.R. 0-6-2 tank, and two L. and S.W.R. 0-4-4 tanks (one G.N.R. colours); all these, excepting one of the "Atlantics," have two-speed clockwork mechanism. There is a steam L. and N.W.R. "George the Fifth" (semi-internally fired) which occasionally makes its appearance.



"FARWAY" TERMINUS.

The passenger coaches—all, with the exception of two L. and S.W.R., in L. and N.W.R. colours—include seven bogie coaches and brake vans, five six-wheeled and three four-wheeled coaches, and two twelve-wheeled dining cars, one of which is home-made, in wood. The goods stock, all made of wood at home, except one oil tank, include two cattle trucks, two refrigerator vans, two

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box wagons, two timber trucks, 15 open wagons (of various companies and private owners); and two six-wheeled and one four-wheeled goods brake vans, of L. and N.W.R. pattern.

The line is equipped with all necessary signals and each of these, except at the terminus, is fitted with a stop catch, so that engines are pulled up when the arm is in the "danger" position. Various additions which make for realism have been provided, such as telegraph posts (but no wires), miniature advertisements, railway staff and passengers, together with accessories for those who travel. Among these is a very complete bookstall at North End station, which no doubt is especially necessary when trains run, as they do on this line, at such infrequent intervals! As indicated, the railway has been completed only recently, and no regular system of working has been devised as yet.

The track is composed of rustless steel rail upon wooden sleepers; this has withstood the test of years without serious deterioration, but weather changes are apt to affect levels and to interfere somewhat with the smooth running of trains, especially where there are points or crossovers, making small repairs necessary from time to time. The only satisfactory remedy for such troubles seems to lie in the provision of a more solid and durable foundation than wood, which, out of doors, is liable to lose its shape, and, even if tarred, eventually to decay. It may be said that although the actual track is literally "permanent way," the buildings, platforms, signals, &c., are all removable and can be packed away securely during bad weather. In conclusion, it may be added, that the model, as it stands to-day, is the result of many experiments and of some disappointments; and that its construction has been carried on with a minimum of expenditure, both of time and money; the motto of the line has ever been "economy with efficiency!" In the eyes of its creator it is far from perfection, but one of the points which helps to preserve the interest of model railways is the constant possibility of additions and improvements.

GATWICK HORSE-BOX SPECIAL TRAIN.

Photo.] SOUTHERN RAILWAY. [*H. Gordon Tidey.*

South Eastern & Chatham 2-6-4 tank engine, No. 790.

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Sunday Trains and Cheap Trips in Early Days.

By FRED LEE CARTER.

FROM the earliest railway days, in Great Britain Sunday trains have been the subject of controversy of some kind or the other. Lately it has taken the form of complaints concerning the alleged insufficiency of this form of public service. But there were

TRIP TO CARLISLE.

THE DIRECTORS OF THE
Newcastle & Carlisle Railway
HAVING KINDLY CONSENTED TO RUN A
SPECIAL TRAIN
TO
CARLISLE
AND BACK,
On Terms similar to those of last Year, the PARTIES who have been the MEANS of OBTAINING this CONCESSION,
GIVE NOTICE
THAT THE
TRAIN
WILL LEAVE THE
NEWCASTLE STATION
AT
Seven o'Clock in the Morning of the 29th Instant,
Taking up Passengers at all the Stations; and will
RETURN FROM CARLISLE
AT SIX O'CLOCK THE SAME EVENING.

Persons wishing to avail themselves of a Cheap Trip, should, in order to secure Seats, provide themselves with Tickets, (which are 7s. 6d. each for the Journey, and may be procured at any of the STATIONS,) on or before Saturday the 28th Instant.

Newcastle-upon-Tyne, August 19th, 1841.

ADVERTISING A SUNDAY EXCURSION TRAIN IN 1841.

times when such trains were worked in the face of the fiercest opposition, particularly when they were openly and avowedly for purely pleasure purposes.

Eighty years is not much in point of time, and there may be some people still living on Tyneside who have seen, and even handled, these old bills which I find amongst the quaint and curious things I have collected about old-time railways. In the days when these bills were distributed by hand or pasted on the hoardings, the "Newcastle and Carlisle Railway" barely entered the town. The cattle market alluded to in them was on the outskirts, with more fields than houses near it.

A REWARD
FOR
SABBATH BREAKING.
People taken safely and swiftly to
HELL!
NEXT LORD'S DAY,
BY THE
CARLISLE
RAILWAY,
FOR 7s. 6d.
IT IS A PLEASURE TRIP!

Had Sinners, will you put a Knife into your own Bowels!

To that have Shares in this Iniquity, your Profits will be a Share in JEHOVAH'S WRATH.

The Devil is murdering Sinners wholesale in Newcastle, and professed Christians are helping him!

IN THE NAME OF GOD,
W. C. BURNS
Ezek. chap. xxxiii. verse 8.

Newcastle, Aug. 28, 1841.

PATTISON AND ROSS, PRINTERS, PILGRIM STREET, NEWCASTLE.

A "SABBATARIAN" RESPONSE!

The line had been laid and opened for traffic in sections and was completed some time before the company dared the vengeance of the "unco guid," and when they did there was more than a flutter in many pulpits. The Novocastrians of those days were strict Sabbatarians and for many years later very straight-laced.

In point of fact this railway enterprise aroused much comment among the inhabi-

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tants and arguments were strong and frequent. The occasion the bill refers to, if I am not mistaken, was not only the first of Sunday trains but it was also the first of those popular excursions generally known as "cheap trips."

The Sabbatarians of that day lacked little in the way of vituperation, spades were spades in very deed and possibly garnished with a forcible adjective. There was no camouflaging of the nether regions in pulpit orations, it was shouted down on the hearers in the broad Doric of the north, and there was no mistaking what place was meant.

The bills were neatly printed and in emphatic capitals the wood block type caught the eye and arrested attention. You might run and yet read.

But let them tell their own tale.

"TRIP TO CARLISLE

THE DIRECTORS OF THE

NEWCASTLE AND CARLISLE RAILWAY

have kindly consented to run a

SPECIAL TRAIN

to

CARLISLE and BACK

on terms similar to those of last year, the *parties* who have been the *means* of *obtaining* this *concession*

GIVE NOTICE

that the

TRAIN

will leave the

NEWCASTLE STATION

at *seven o'clock* in the *morning* of the 29th instant,

taking up passengers at all the stations and will

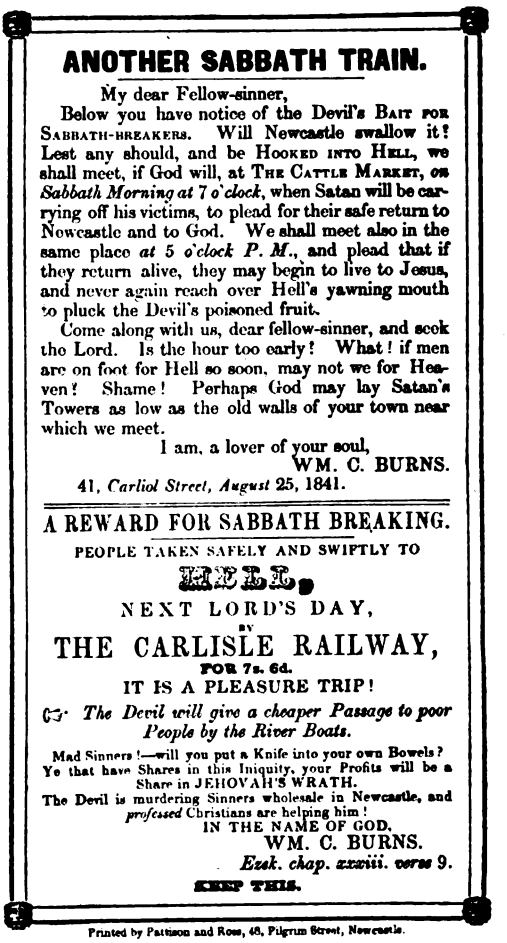
RETURN FROM CARLISLE

at six o'clock the same evening.

Persons wishing to avail themselves of a cheap trip should, in order to secure seats, provide themselves with tickets (which are 7s. 6d. each and may be procured at any of the stations) on or before Saturday, the 28th instant.

Newcastle-upon-Tyne, August 19, 1841."

This very soon produced a counterblast on every hoarding as will be seen by the bill beginning "A Reward for Sabbath Breaking," which is reproduced on the previous page.



ANOTHER SABBATH TRAIN.

My dear Fellow-sinner,

Below you have notice of the Devil's BAIT FOR SABBATH-BREAKERS. Will Newcastle swallow it! Lest any should, and be HOOKED INTO HELL, we shall meet, if God will, at THE CATTLE MARKET, *on Sabbath Morning at 7 o'clock*, when Satan will be carrying off his victims, to plead for their safe return to Newcastle and to God. We shall meet also in the same place *at 5 o'clock P. M.*, and plead that if they return alive, they may begin to live to Jesus, and never again reach over Hell's yawning mouth to pluck the Devil's poisoned fruit.

Come along with us, dear fellow-sinner, and seek the Lord. Is the hour too early! What! if men are on foot for Hell so soon, may not we for Heaven! Shame! Perhaps God may lay Satan's Towers as low as the old walls of your town near which we meet.

I am, a lover of your soul,

WM. C. BURNS.

41, *Carliol Street, August* 25, 1841.

A REWARD FOR SABBATH BREAKING.

PEOPLE TAKEN SAFELY AND SWIFTLY TO

HELL

NEXT LORD'S DAY,

BY

THE CARLISLE RAILWAY,

FOR 7s. 6d.

IT IS A PLEASURE TRIP!

☞ *The Devil will give a cheaper Passage to poor People by the River Boats.*

Mad Sinners!—will you put a Knife into your own Bowels? Ye that have Shares in this Iniquity, your Profits will be a Share in JEHOVAH'S WRATH.

The Devil is murdering Sinners wholesale in Newcastle, and *professed* Christians are helping him!

IN THE NAME OF GOD,

WM. C. BURNS.

Ezek. chap. xxxiii. verse 9.

KEEP THIS.

Printed by Pattison and Rose, 48, Pilgrim Street, Newcastle.

A HANDBILL ISSUED AT THE SAME TIME.

Meanwhile a small bill was being distributed by hand to all and sundry which if it deterred some from the perilous journey, according to Mr. Burns did not prevent the trip being a success, nor is there any record that any of the trippers went anywhere else than to the border town of Carlisle.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at* 5s. *net, or by post from the* RAILWAY MAGAZINE *Offices,* 33, *Tothill Street, Westminster, London, S.W.*1, *to any part of the world,* 5s. 9*d. The twenty-sixth Annual Edition* (1923) *is in preparation and it will be published as soon as the final figures for* 1922 *are available.*

102 M.P.H.

There are many "legends" as to exceptional speeds alleged to have been made in the "40's," including those concerning locomotives such as the Great Western Railway engines you mention, including *Grasshopper, Hurricane,* &c., as well as in regard to London and North Western Railway locomotive *Cornwall.* There do not appear, however, to be any records which can be considered as being in any way authenticated, and the principal value of the late Mr. Charles Rous-Marten's record on the Great Western Railway is that it was so carefully timed, and is, therefore, as nearly as possible authenticated beyond criticism. The historical locomotives you mention have all been described at one time or another in the RAILWAY MAGAZINE, and you will find particulars in Sekon's "Evolution of the Locomotive" and other historical works and articles.

[Reply to G. TAYLOR.]

Hotwells Branch.

Referring to the reply given in the January RAILWAY MAGAZINE, Mr. H. L. Cooper writes that this branch was actually closed in July, 1922, to enable the Bristol Corporation to construct a new road to Avonmouth. He points out that during the war, large numbers of dock workers and people travelling to local munition factories made use of the branch, and the dock workers continued to do so until it was closed, though there may not have been much ordinary public traffic. Messrs. J. Bond and F. J. Fear also write to the same effect, the former mentioning that the line was closed for traffic during 1922 under an arrangement with the local authorities, whereby the lines were to be dismantled and the ground occupied to be utilised for widening the public roadway.

[Further reply to P.H.S.D.]

Will Electrification be Standardised?

A Ministry of Transport Committee recently reported in favour of standardised electrification, allowing, however, the "Brighton" system as an exception to direct current. No action has yet been taken in this connection, while on the Southern Railway it appears likely that the system to be adopted for the South Eastern and Chatham section will differ in some respects from that on the London and South Western section, as well as from that on the Brighton division. It is possible to adapt locomotives and motor cars for working with variations of the one system, but so far, except for the report of the Ministry of Transport referred to, the prospects of standardisation are not very decisive.

[Reply to R. W. N. SIMPSON.]

Great Northern Railway Locomotives.

Although the 4-4-2 locomotives do splendidly, obviously there must come a time when for certain duties a still more powerful class is required. The 2-6-0 engines, although they have been used for express work, are not directly suitable therefor. We agree that a frequent ser-

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vice may be more desirable than the running of a lesser number of heavy trains, but on the Great Northern this may not be practicable in view of the large number of goods and mineral trains to be operated over parts of the main lines, as well as other traffic. Opinions vary as to the nomenclature suitable for locomotive engines.

[Reply to R. LANGSLOW.]

Joint Lines and Grouping.

Full particulars as to the railways to be included in each group are given in the RAILWAY YEAR BOOK. The Midland and South Western Junction Railway is to go into the Great Western Railway, while the Stratford-on-Avon and Midland Junction Railway will go into the London Midland and Scottish Railway. No information is yet available, as we have already pointed out, as to the joint railways, and presumably they will continue to be operated more or less as at present, except that the grouped companies will be parties instead of railways hitherto forming sections thereof.

[Reply to R. GOODCHILD.]

Postal Services.

Mail matter from London to the north-east coast is taken by the 8.25 p.m. from St. Pancras, *via* Leicester, Derby, Sheffield and York. Special joint postal stock is employed, lettered "M. & N.E.J.P.S." (Midland and North Eastern Joint Postal Service). Two North Eastern sorting tenders are also run attached to the 8.25 p.m. from King's Cross for local mails from the Great Northern line to the north eastern counties. Return workings are at 7 p.m. from Newcastle to the Midland line and London, and at 7.15 p.m. to the Great Northern line.

[Reply to "POSTAL."]

War Use of Railways.

A reader, whose signature is indecipherable, points out that the American Civil War terminated in 1865, so that the reference should be to the years immediately preceding 1866. Mr. O. Elsden points out that at least one exclusively military railway was built in 1855, during the Crimean War, the engine used on this line, five or six miles in length, and of 5 ft. 6 in. gauge, afterwards going to South America where it is said to have caused the adoption of the 5 ft. 6 in. gauge in the Argentine Republic.

[Further reply to T. W. LINSELL.]

Indicated Locomotive Horse-power.

Formula given in September, 1920, issue was correct. Your error has probably been that of using the *working* pressure of the engine (or the percentage of the working pressure used in the tractive force formula), instead of the *mean effective pressure*, which can only be obtained from indicator diagrams taken from the engine cylinders while in motion. Maximum horse-powers are usually developed in surmounting inclines at fairly high speeds.

[Reply to G. E. H. ROBERTS-HAY-BOYD.]

South Eastern and Chatham Railway Locomotives.

There are no 4-6-0 or 4-6-2 tender engines in use on this line, mainly owing to the fact that such large engines could not be operated over many sections, in combination with the fact that locomotives on this line may be required to work over widely varied routes. No doubt, locomotives belonging to the three principal railways of the Southern group will be tested on various sections and in due course through working from one to another will certainly follow.

[Reply to H. F. PENFOLD.]

Conditions under Grouping.

We have already explained that altered train working and other possibilities which grouping will introduce can only occur gradually, while it is doubtful whether the question of colours for locomotives and rolling-stock has even received consideration, this being a detail which does not require attention at this stage. Your suggestion that trains might be run through from Richmond to Moorgate Street is of interest, but whether it will ever be carried out remains to be seen.

[Reply to C. M. COTTON.]

Quintuple Trains, Great Northern Railway.

Weight of the 5-car set is 118 tons 3 cwt. 2 qr., and the total length, 246 ft. 1 in. A four-coach set, previously occupying substantially the same length,

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weighed 139 tons 2 qr., accommodating 38 first and 72 third class passengers, as compared with 48 first and 80 third class passengers in the new set, notwithstanding that there is a separate kitchen car instead of portions of two adjacent vehicles being utilised. [Reply to J. A. DANE.]

Slip Coaches.

Special regulations apply to safeguard possibilities in the case of a slip service. Unless all signals are "clear," a stop has to be made instead of slipping. If the communication cord is pulled on the main train the general rule is that the driver must continue until past the station and must avoid checking until he is sure that the slip guard is prepared to apply his own brakes and thus avoid a collision.

[Reply to H. S. GREATOREX.]

Railway Maps.

Frequently, articles dealing with particular railways or sections of lines are illustrated with maps, but this is not always convenient, especially where reference to the RAILWAY YEAR BOOK or an ordinary railway map would sufficiently meet the case. However, your suggestion will be borne in mind. Your kind remarks in reference to the January number are appreciated.

[Reply to C. N. YOUNG.]

South Eastern and Chatham Railway Branches.

Both the Gravesend-Port Victoria and Queenborough branches are still in use, though in the former case the traffic is purely of a local character, while in the latter case there are one or two through trains in addition to the local connections. See also "Pertinent Paragraphs."

[Reply to "EXILE."]

French Railways.

Since the war all the chief French railways have shown a serious deficit on their working, fares and rates not having been raised proportionately to increased working costs. Fares are approximately as follows (in centimes per kilometre) :—1st class, 21 ; 2nd class, 14 ; 3rd class, 9 ; and for return tickets, 32, 22 and 14 centimes respectively, including tax.

[Reply to H. E. TAYLOR.]

Wakefield—King's Cross.

Prior to the war the fastest schedule over this route of 175¾ miles, in force for some three years, was that of the 2 p.m. from Leeds, which was booked to leave Wakefield (Westgate) at 2.20 p.m., and reach London (working time) at 5.27 p.m. In the public book the arrival was given as 5.25 p.m. (185 min.), and the latter was generally worked to.

[Reply to "NEMO."]

Halifax High Level Railway.

The line from Holmfield to St. Paul's station at Halifax, joint between London and North Western (Lancashire and Yorkshire) and Great Northern Railways, is at present used only for goods traffic. Remainder of your questions, in addition to being in excess of the number allowed, are not of sufficient general interest for inclusion.

[Reply to "CASTLEFORD."]

Paisley (Canal) Route, Glasgow and South Western Railway.

Distance from Glasgow (St. Enoch) to Elderslie, *via* Paisley (Canal), is 10 miles 19 chains ; or 43 chains further than *via* Gilmour Street. We have not the other information for which you ask, but you may rest assured that no high speed schedules have ever been in force over the two routes you mention.

[Reply to A. W. ANDERSON.]

Locomotive No. 314, London and South Western Railway.

If you will refer again to the illustration on page 78, February, 1922, RAILWAY MAGAZINE, you will see that the number of 2–4–0 tank engine No. 314 is underlined, indicating that it is on the duplicate list, the same number having been given to a new engine, 4–4–0 locomotive No. 314 illustrated in the December number.

[Reply to J. S. FROST.]

Reid-Ramsay Turbo-Electric Locomotive.

This engine was fully described in the RAILWAY MAGAZINE for May, 1922. It was built by a private firm, and was to be tested in standard railway service on various lines ; hence its appearance at Horwich works, though we have no information as to the results of any trials which may have been carried out.

[Reply to J. F. DONE.]

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Electric Train Staffs.

Webb and Thompson electric train staffs have a large looped handle to enable them to be exchanged by hand in the case of non-stopping trains passing at slow speeds, or to adapt them for looping on to or from the arm of an exchanging post, or have a smaller loop for exchanging at speed by exchanging apparatus where installed.

[Reply to E. H. POTTS.]

Tubular Bridges.

The bridges you mention are really designed as huge hollow girders, the railway tracks being carried inside instead of on top. This type has only occasionally been employed, but several of those which have been so constructed are of notable design, including that over the Menai Straits.

[Reply to N. MCINTYRE.]

Holborn and British Museum Stations.

Although several schemes for constructing a passage connecting Holborn (London Electric Railway) and British Museum (Central London Railway) stations have been considered from time to time, none has been found to be practicable, and we are given to understand that the scheme is not likely to be revived.

[Reply to L. A. DENT.]

Great Southern and Western Railway Locomotives.

The "321" and "331" classes have balanced slide valves, and we are informed by Mr. J. R. Bazin, Chief Mechanical Engineer, that none of these engines are superheated or are being fitted with superheaters. No. 326 of the "321" class was superheated in 1912, but now runs as originally built.

[Reply to "GALTEEMORE."]

Head Codes, Caledonian Railway.

On this line the standard head codes are not used, and, with a few exceptions, all trains carry the same head lights. On certain routes, principally to or from Glasgow (Central) and Edinburgh (Princes Street), a semaphore device is used for indicating route or destination by day.

[Reply to J. H. SEWELL.]

West Riding and Grimsby Joint Line.

From Doncaster North Junction to Wakefield (including Westgate station) was joint Great Northern and Great Central line until the grouping took effect in January, when it passed into the London and North Eastern group. Signals are of Great Northern pattern.

[Reply to "CASTLEFORD."]

Combination Brake Vans.

We are now informed that the vehicles referred to, and of which particulars were given by you are, in two cases, ordinary 10-ton goods brake vans, and, in the other, a 16-ft. van truck. You are, therefore, in error in regarding them as of special type.

[Further reply to K. W. S. M.]

Severn Tunnel.

This is not lighted throughout, though at certain places, as adjacent to the pumping plant, electric light is, no doubt, provided. Probably, however, the lights you noticed were those carried by men working on the permanent way.

[Reply to R. P. LATCHEM.]

North Eastern Railway Electric Rolling-Stock.

These vehicles are operated on the multiple unit system, and it is therefore necessary to provide for connections throughout the train; also for lighting in addition to the usual brake connections.

[Reply to K. W. S. M.]

The Largest Railway Station.

While the newspaper cutting you send includes a degree of descriptive exaggeration, it is substantially correct, the Grand Central Terminal, New York, now ranking as the largest railway station in the world.

[Reply to T. K. GASKELL.]

London & Manchester Times.

It is probable that in due course there will be accelerations in regard to the principal trains, but this might equally have occurred with or without grouping.

[Reply to N. MCINTYRE.]

London and South Western *v* Great Western 4-6-0 Engines.

We have answered this question on more than one occasion previously. Please consult back issues.

[Reply to C. G. LEIGH-HUNT.]

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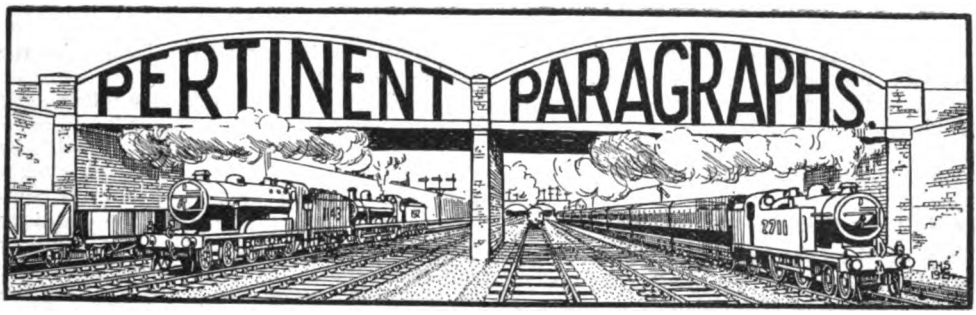

New Year Fare Reductions.

CONCURRENTLY with the inauguration of the four great railway companies which now comprise the main railway system of Great Britain, the general reduction in passenger fares from January 1 will render that date an important one in the history of British railways. We have already referred to the fact that the Christmas and New Year excursion arrangements were largely based upon the new fares, and we understand that the results proved most satisfactory. It is, however, the setting up of the new basic rates which is most important, notably, the adoption of 2½d. per miles for first-class fares—in itself a very big concession which should be abundantly justified—while the adoption of 1½d. per mile for third-class fares is in accordance with the general economic situation. Officially, no reductions are made in workmen's fares, but where they are governed by the ordinary rates they also participate in the reduction, as also excursion, market and various other reduced fare tickets which are so widely used. Naturally, there are a few apparent anomalies, and, in some instances, passengers have, we believe, considered themselves aggrieved in that they were called upon to pay the same fares on January 1, 1923, as on December 31, 1922, or that the reduction proved to be a very small one. This applied chiefly, however, on lines where return tickets were charged at considerably less than double single rate. In fact, in many instances, the return fares, even if unaltered, are still less than the company is entitled to charge. In some cases, too, the revised fare has been based, not upon the mileage rate which the company is entitled to charge, but upon pre-war charges which were, even then, below the 1d. per mile rate. Wherever, however, the fares were based upon the mileage rate, including a few special allowances for which railway companies are entitled to charge one or more miles additional in view of the heavy cost of a special engineering work (such as the Forth Bridge), the full benefit of the reduction has been given.

The "Underground" lines were in a different position, in that, although their fares were raised, they were not associated with the standard increases of the main line railways. In fact, although the "revised" fares of recent years were increases upon pre-war rates, they never, in regard to the "Underground" lines, equalled those upon other railways. As now reduced, the 1d. fare is still to come, but, otherwise, reductions, have been made very generally, and "Underground" travellers have the further advantage that season tickets have shared in the reduction.

Broad Street to Southend.

THE introduction, from January 1, by the London Midland and Scottish Railway, of through trains between Broad Street and Southend, may be regarded as one of the first fruits of grouping, though from early days there have always been close associations between the North London and London, Tilbury and Southend Railways, and through trains were run between Chalk Farm and Southend during the summer season for some years prior to the war. The new service, however, may open the way for regular facilities to and from Broad Street, thus providing much-needed relief for the trains to and from Fenchurch Street, which are still loaded to their fullest capacity during the "rush" hours, notwithstanding the large numbers of passengers travelling by Metropolitan District local and through trains to and from East Ham and Barking and the Ealing–Southend trains. The new trains utilise the 8.28 a.m. from Thorpe Bay as far as Barking, but, in the down direction, provide further facilities, in that the 2.5 p.m. (Saturdays only) from Broad Street, not only takes up the running of the 2.32 p.m. from Barking to Upminster, but is extended through to Shoeburyness, serving all stations except East Horndon and Pitsea, while the 6.23 p.m. from Broad Street (except Saturdays) incorporates the 6.50 p.m. from Barking to Pitsea, extended through to Shoeburyness. This latter train is continued as a local between Barking and Shoeburyness

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on Saturdays as hitherto. These new facilities will, no doubt, be appreciated by many Southend business people engaged in the vicinity of Broad Street and for whom the Great Eastern stations at Southend and Prittlewell are not convenient.

The Railway Clearing House.

ONE of the consequences of the amalgamations under the Railways Act is to reduce the number of companies members of the Clearing House from 58 to 20, consisting of four amalgamated companies and 16 other companies. The Clearing House have power under Section 14 of the Act to prepare a scheme to effect necessary alterations in their constitution and to submit it for settlement to the Amalgamation Tribunal. This they have now done, and the scheme, amended by the Tribunal in various respects, settled, taking effect from January 1, 1923. The general result is to give equal representation to the amalgamated companies and the other companies and joint companies, the former appointing four delegates each, and the latter one apiece, or 32 in all. The quorum is reduced from 10 to 6, and various other provisions made for the meetings and business. A proposal to give the Clearing House power to pay delegates was rejected as not coming within the provisions of Section 14 of the Act, and the provisions of the Third Schedule, as required by the Act, are applied to the existing officers and servants. There can be no doubt that the effect of the amalgamations eventually will be greatly to simplify the operations of the Clearing House, and to reduce the volume of the present routine, although doubtless here as elsewhere the change will be gradual. Whether under the new regime, the position and functions of the Clearing House and of its valuable committees will be affected in other ways, and to compensate as it were, for the reduction of its work on through rates, other duties may be imposed upon it, time will show.

The Lighter Side of Grouping.

FOR a long time past we have had to deal in various ways with the serious aspects of railway grouping and amalgamation, but a correspondent of the *Manchester Guardian* raised some interesting points of a more or less humorous character which may fittingly form the text for a few remarks "in lighter vein." He commences by mentioning that the district where he is domiciled was served by two railway companies, designated A and B, which had very different ideas as to how to treat their customers. Consequently "we are all discussing with fear and trembling the question which company will mould the other to its way of thinking in the coming fusion."

Anticipating "the worst," the following is a "summary of our forebodings";—

"The rolling-stock of line A will be thoroughly overhauled, cracks being skilfully made in the woodwork of each compartment to bring it up to the requisite draught standard of line B. The windows will be readjusted to enable them to produce that soothing rattle which distinguishes the B windows.

"The lighting arrangements of line A will require drastic modification, as they permit passengers to read in comfort. A long series of experiments may be necessary before the distinctive gloomy half-light of B is attained.

"The heating apparatus of A will be scrapped—in its place will be installed that peculiar machinery which is paralysed by the advent of frost, and which spasmodically envelopes the fortunate possessor of the middle seat in a cloud of steam.

"The ranks of the unemployed will be further swelled by the discharge of the worthy people who at present keep the windows of A so clean.

"Classes will be held to instruct all employees of line A in the correct principles of behaviour towards passengers, and prizes will be given for the best individual performances in (1) contriving to make a passenger take the wrong train; (2) refusing to give any information whatever."

All of which goes to show that regular passengers appreciate comfortable travel conditions, and that where comparisons are invited, by force of circumstances, they may sometimes be "oderous."

Isolation of the Isle of Sheppey.

THE isolation of the Isle of Sheppey from the rest of England, so far as rail and road communication are concerned, resulted, during the night of December 17, 1922, from a steamer colliding with and damaging the viaduct of the roller lift bridge, which provides the only rail and road communication between the island and mainland. The lifting section of the bridge was the first of the Scherzer type to be erected in Great Britain. It carries a single line of railway and parallel with it a public highway. The original viaduct, known as the King's Ferry bridge, was built for the Sittingbourne and Sheerness Railway, and opened in July, 1860. The lifting span was of a type then usual, but not suitable for heavy locomotives. This opening span was replaced in 1904 by the Scherzer lifting span. The RAILWAY MAGAZINE for January 1905, contains an article on this bridge, with

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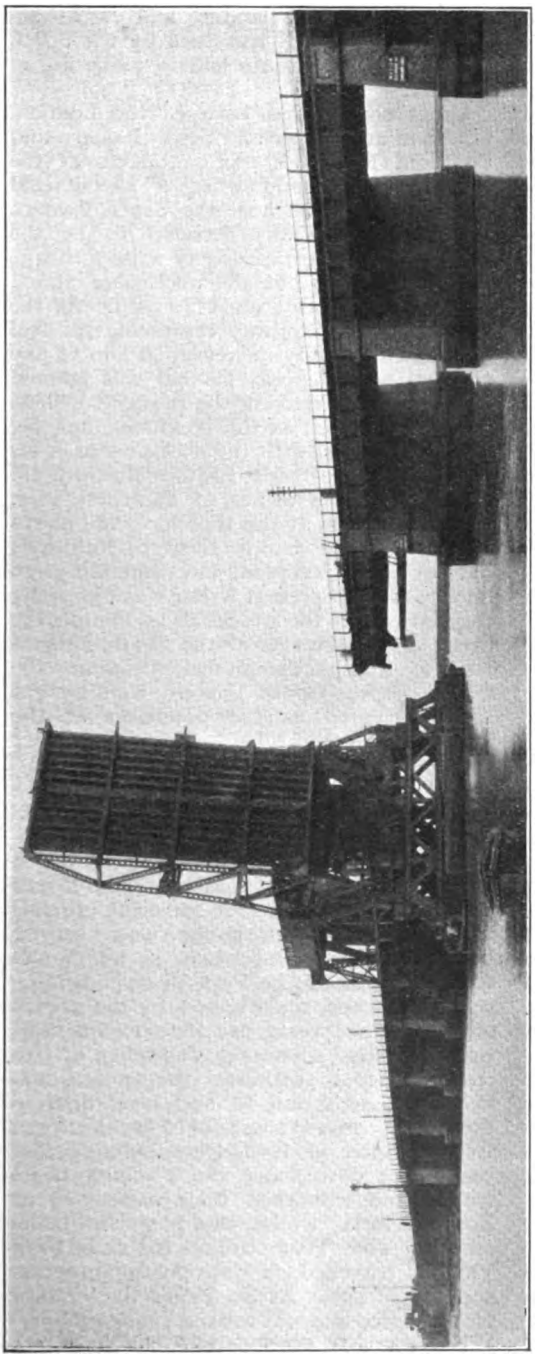
illustrations of the old and new lifting spans. At the time the original bridge was constructed, doubts were expressed as to it being sufficiently strong to carry the 4-4-0 saddle-tank locomotives, weighing 32 tons each, which then comprised the locomotive stock of the East Kent Railway, which had agreed to work the Sittingbourne and Sheerness Railway.



KING'S FERRY BRIDGE WEST SIDE, LOOKING NORTH-EAST, AFTER THE ACCIDENT.

Two lighter engines were therefore employed to work the traffic, viz., *Cubitt* and *Magnus*. The former was a four-wheel tank engine on Crampton's system, with cylinders 12 in. × 18 in., and had been used as a contractors' engine during the construction of the East Kent Railway. *Magnus* was a 0-4-0 pannier tank engine, built by Hawthorn & Co., with wheels 4 ft. diam. and cylinders 13 in. × 16 in. It was named after the chairman of the Sittingbourne and Sheerness Railway. Some years later *Magnus* had a pair of 3-ft. trailing wheels added, and when Mr. Magnus was no longer connected with the Sittingbourne and Sheerness Railway, the name was changed to *Magnet*, the locomotive being taken off the Sheerness branch service. *Magnet* was scrapped in 1881.

Intensive Competition for the Sheerness Traffic.

In the 'seventies and 'eighties of the last century, when the London, Chatham and Dover Railway was invading every district served by the South Eastern Railway, the latter made reprisal by seeking to capture a portion of the London-Sheerness traffic—practically the only preserve of the London, Chatham and Dover Railway. From the opening of the Sittingbourne and Sheerness Railway, the South Eastern Railway had competed for the traffic between Strood, Chatham and London and Sheerness, by steamers running on the Medway, between Sheerness and Strood, connecting at the latter place with trains to and from London. This partly train, partly river service could never be an effective competition in the matters of speed and convenience, although it resulted in the cutting of fares. The South Eastern Railway took steps to provide a better route to Sheerness. In 1879, powers were obtained for the construction of a railway from the North Kent line, at a spot 3¼ miles east of Gravesend, through the marshes at the mouths of the Thames and Medway to the village of Stoke, a distance of 9 miles. This did not excite suspicion on the part of the London, Chatham and Dover Railway;

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the district was a thinly populated agricultural one, and unprovided with railway communication. The next year, however, powers were sought and obtained for extending the line an additional 3½ miles to St. James, in the Isle of Grain, with a deep-water landing stage on the Medway.

This naturally opened the eyes of the London, Chatham and Dover Railway, as a Continental service could be worked from this point, which would be outside the territorial limits of the South Eastern and London Chatham and Dover Continental agreement, whilst the distance to London from the Medway landing stage was only 40 miles, as against 50 miles from Queenborough pier. Furthermore, Sheerness was opposite the site of the pier, across the Medway. The London, Chatham and Dover Railway, having now appreciated the force of the approaching attack on Sheerness, in 1881 sought and obtained Parliamentary powers to improve its position there. Its terminus was at the Dockyard, away from the town proper, so an Act was obtained to construct an extension about 1,100 yards in length into the town. This was opened June 1, 1883. The extension branches from the Dockyard station by a junction facing for up trains so that all trains to and from Sheerness-on-Sea station have to reverse at the Dockyard station.

The South Eastern at Sheerness.

THE single line Hundred of Hoo Railway was opened throughout from Hundred of Hoo Junction to Port Victoria, as the Medway deep water wharf was named, on September 11, 1882. It will be observed that the South Eastern Railway had lost no time in constructing the 12½ miles of railway and the landing stage. For the river service between Port Victoria and Sheerness, two paddle steamers were constructed, *Myleta* and *Edward William*, 156½ ft. long, 35 ft. broad and 7 ft. 6 in. deep, with a speed of 12 knots. The third class fares between London and Sheerness by the all-rail route had been 3s. 11d. single, 6s. 4d. return, with "cheap fast" trains at 3s. 3d. single and 5s. return. The through fares by the South Eastern Railway route *via* Port Victoria were—third class, 3s. 6d. single and 6s. return. Cheap fast 3s. single and 5s. return, but it was possible to save 3d. on the single journey and 2d. on the ordinary return tickets and as much as 8d. on the return cheap fast fares, by booking to Port Victoria and paying the ferry charge separately. The London, Chatham and Dover Railway soon reduced their fares to the level of those of the South Eastern Railway, but as passengers by the London, Chatham and Dover route to Sheerness passed through Chatham, the fares to that important town had also to be reduced.

A year or so after the South Eastern Railway's service to Sheerness had been instituted, the Sheerness Pier was put up to auction. It was obviously advantageous for the South Eastern Railway to purchase the pier, which carried the right to levy tolls on passengers landing and embarking at Sheerness, as all travellers by the South Eastern Railway route had to make use of the pier.

Great competition between the London, Chatham and Dover and South Eastern and Chatham Railway's representatives at the auction ensued, and when a phenomenal sum had been reached, the South Eastern Railway bidder was declared to be the purchaser. He proceeded to write a cheque for the deposit, but the auctioneer stated that a cash deposit must be paid. As the South Eastern Railway representative had not sufficient ready money upon him to pay the full cash deposit, his bid was ignored and the person making the previous highest bid was accepted as the purchaser, and he, having attended with the necessary cash for the deposit, the South Eastern Railway did not become the owner of Sheerness Pier. The newspapers at the time gave the above reason for the South Eastern Railway's bid not being accepted, but some ten years later, when the present writer was discussing the matter with the late Sir Myles Fenton, the then General Manager of the South Eastern Railway, that gentleman denied that was the reason for the South Eastern Railway not being accepted as the purchaser at the auction, although he offered no other explanation.

Post-Amalgamation Use of the Ferry Steamers.

AFTER the working union of the South Eastern and London, Chatham and Dover Railways, there was not sufficient grounds for the Port Victoria-Sheerness service being continued, and when it was found that the piles of the Port Victoria landing stage had been undermined by the attack of a marine worm, so that replacement was necessary, advantage was taken of this circumstance to withdraw the service, and the trains only ran to and from Sharnal Street, 6½ miles short of Port Victoria. In the winter of 1900, Queenborough Pier was burnt down, and the Flushing boats landed and embarked their passengers at Port Victoria, whilst the pier was being rebuilt. The boat trains to and from Victoria, travelled *via* Metropolitan Junction and Blackfriars, At St. Paul's the Victoria part reversed and was worked *via* Loughboro' Junction and Brixton. The Holborn Viaduct

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portion was detached at St. Paul's. The ferry steamers being no longer required at Port Victoria, were employed by the South Eastern and Chatham Railway in more recent years for pleasure cruises during the summer between Ramsgate, Deal, Dover, &c., but the outbreak of war in August, 1914, put an end to this use.

Port Victoria—Sheerness Service restored.

AFTER the mishap to the bridge no time was lost in arranging a temporary service at the King's Ferry, but at first no use was made of the Port Victoria route. Not many days elapsed, however, before the advantage of the Port Victoria route to and from London was recognised, and from December 27, a service of boats was put into operation, to serve both Sheerness and Queenborough Pier. The week-day train service between Gravesend and Port Victoria was increased from six trains in each direction to eleven. All the boats to and from Port Victoria (except two each way) terminated at and started from Queenborough Pier, calling at Sheerness Town Pier *en route*.

The only service between London and Sheerness during the time the bridge is closed is thus *via* Port Victoria, with Charing Cross and Cannon Street as the London *termini* in place of Victoria and Holborn; although a motor-boat service, more or less connecting with local trains, is provided. The talk of developing Port Victoria as a place for embarking and disembarking passengers by ocean liners has never fructified. A development of Port Victoria might have been made by using it for discharging cargoes of mineral oil, but Purfleet and Thames Haven have obtained this trade. The fact that Port Victoria is outside the limits of the Port of London, although advantageous in some ways, may have proved a bar to its development.

The World's Railway Mileage.

A RECENT issue of railroad data, published by the Association of Railway Executives of New York, summarises the annual compilation by the *Archiv für Eisenbahnwesen* of the railway mileage of the world. An analysis of this compilation, which relates to the year 1920, discloses some interesting information as to the relative mileage in the various countries. The world's mileage in 1920 was 748,005 miles. This is distributed among the continents as follows :—

	Mileage.	Per cent. of total.
North and South America	380,194	50·8
Europe	237,888	31·8
Asia	74,115	9·9
Africa	32,239	4·3
Australia	23,569	3·2
Totals ..	748,005	100·0

North and South America combined contain over one-half of the railway mileage of the world, America and Europe combined contain over four-fifths, while the great areas of Asia, Africa and Australia combined represent the remainder of less than one-fifth. The railway mileage of the United States of America is reported as 264,373 miles. This is approximately 70 per cent. of the total mileage of the Americas and 35 per cent. of the mileage of the world. It exceeds the total mileage of Europe by 11 per cent. and that of Asia, Africa and Australia combined by more than 100 per cent.

How the railway mileage of the United States compares with that of some of the other countries of the world can best be indicated by means of multiples, showing how many times the mileage of the United States is more than that of the other countries. These countries are the 10 which stand next to the United States in point of mileage :—

	Railway mileage.	Ratio of U.S. mileage to mileage of country named.
United States	264,373	—
Russia (including Asiatic)	51,646	5·1 times.
Canada	38,888	6·8 ,,
British East Indies ..	36,325	7·3 ,,
Germany	36,131	7·3 ,,
France	35,145	7·5 ,,
British Isles	24,396	10·8 ,,
Argentina	23,156	11·4 ,,
Brazil	17,478	15·1 ,,
Mexico	15,841	16·7 ,,
Italy	12,501	21·1 ,,

Strengthening the Floor, etc., of the Forth Bridge.

IN the course of a paper read recently before the Institution of Civil Engineers, Mr. W. A. Fraser, Chief Engineer, North British Railway, described the renewal of the inner rail-troughs and the buckled plating of the floor of the bridge, the strengthening of the cross transoms of the internal viaducts, and the provision of additional cross bracing between the main girders of the approach spans.

The rails which form the up and down lines on the bridge are carried on timber waybeams, laid in four continuous steel troughs. The two outer troughs form the top boom of the main girders of both the north and south approach spans and the internal viaducts. The two inner rail-troughs, on the other hand, are carried on cross transoms which span between, and connect to, the side plates of the top booms of these girders. From bay 4 of the cantilevers, where the internal viaduct terminates, to the ends of the cantilevers and across the central spans,

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the four troughs are carried on cross transoms spanning between the bottom booms of the cantilevers and the main girders of the central spans. The section of the old troughs was uniform throughout the bridge, with the exception of the troughs over the cantilever ends and central spans, which had a heavier section to suit the wider spacing of the transoms.

Heavier Trains to be Carried.

In the course of renewing the timber waybeams in 1906, it was discovered that the bottom plates of the inner troughs were fractured between the rivet-holes in many places at the support of the trough on the cross transom, and that a large number of the rivets connecting the trough and transom had worked loose. The horizontal rivets in the cross transom connecting the top angle and web immediately beneath the inner troughs had also worked loose through lack of rigidity in the transom, these rivets having on previous occasions given trouble. The defects were attributed previously to (*a*) the heavier loads passing over the floor of the bridge, and (*b*) the lack of rigidity of the inner troughs as compared with the outer troughs, the destructive effect being accentuated by water and grit discharged from the inside of the troughs. In 1890, when the bridge was opened for traffic, the weight of a locomotive was 77¼ tons, with a maximum axle-weight of 15½ tons, whereas to-day these weights amount to 119¾ and 20 tons respectively.

Before the new waybeams were placed, all the loose rivets were cut out, the fractured bottom plates were reinforced with covers placed inside the troughs, and new rivets were inserted. In 1908, while the renewal of the timber waybeams was still in progress, it was evident that the repairs were not likely to prove satisfactory, as a large number of the new rivets had again worked loose. In 1909 it was decided as an experimental measure, to insert an additional cross transom between the existing transoms at bays 3 and 4 of the cantilevers, so as to give additional support to the lighter inner rail-troughs. The provision of these transoms did not, however, provide a remedy for the deterioration at the bearings, which by 1911 had developed to such an extent as to necessitate consideration of further remedial measures. It was decided, therefore, to renew the inner rail-troughs and buckled plating on the approach and internal viaducts, to strengthen and stiffen the cross transoms of the internal viaducts, and at the same time to provide additional cross bracing between the main girders of the approach spans so as to brace each panel-point, the existing bracing being arranged at alternate panel-points only. The new troughs are constructed of three steel channels 17 in. deep, which had to be specially rolled, and which give a very stiff section with a minimum amount of riveting—a matter of considerable importance in a floor of this type. Other measures adopted were described in detail by Mr. Fraser.

Special Traffic Working during Renewal.

The work was carried out by means of timber platforms hung from the main girders. The renewal of the troughs and work in connection therewith was done on Sundays, the remainder of the work, which did not interfere with the running-lines, being carried out in stages during the week. On Sundays it was necessary to retain one line for traffic, and for this purpose a fully-equipped electric tablet system of single-line working was installed. The up and down lines were closed on alternate Sundays, the troughs in both lines for one section being completed before the work on another section was commenced. The work, the greater part of whch was carried out under war conditions, was commenced in May, 1914, and was completed in September, 1920, the number of troughs laid being 340, occupying 145 Sundays. The approximate weight of old steelwork removed from the bridge was 2,400 tons, and the weight of new steelwork used was 3,212 tons. The net cost of the work, exclusive of the cost of the work in lifting and replacing the timber waybeams, rails, &c., was £147,299. The contractors for the renewal of the steelwork were Sir William Arrol & Co.

Rail Motor Cars in New South Wales.

Adapted motor road vehicles are already in use on several branch lines of the New South Wales Government Railways, and we are informed by Mr. A. A. Bowles, of the Engineer's Department, Sydney, that a new type of vehicle is now being introduced. These vehicles, which are being constructed at the Eveleigh workshops, are not conversions from road designs. Instead, a standard suburban carriage has the end platforms enclosed to form the driver's compartments, and a 150 h.p. 6-cylinder reversible engine (designed and built especially for the purpose) installed to provide motive power. The motor is supported on springs under the carriage floor, about midway, and so that its working will not interfere with the comfort of passengers. The engine can be controlled from either end. The vehicles are 50 ft. 9 in. long over headstocks, mounted on bogies having a 7 ft. wheelbase, the complete wheel base being 41 ft. Accommodation

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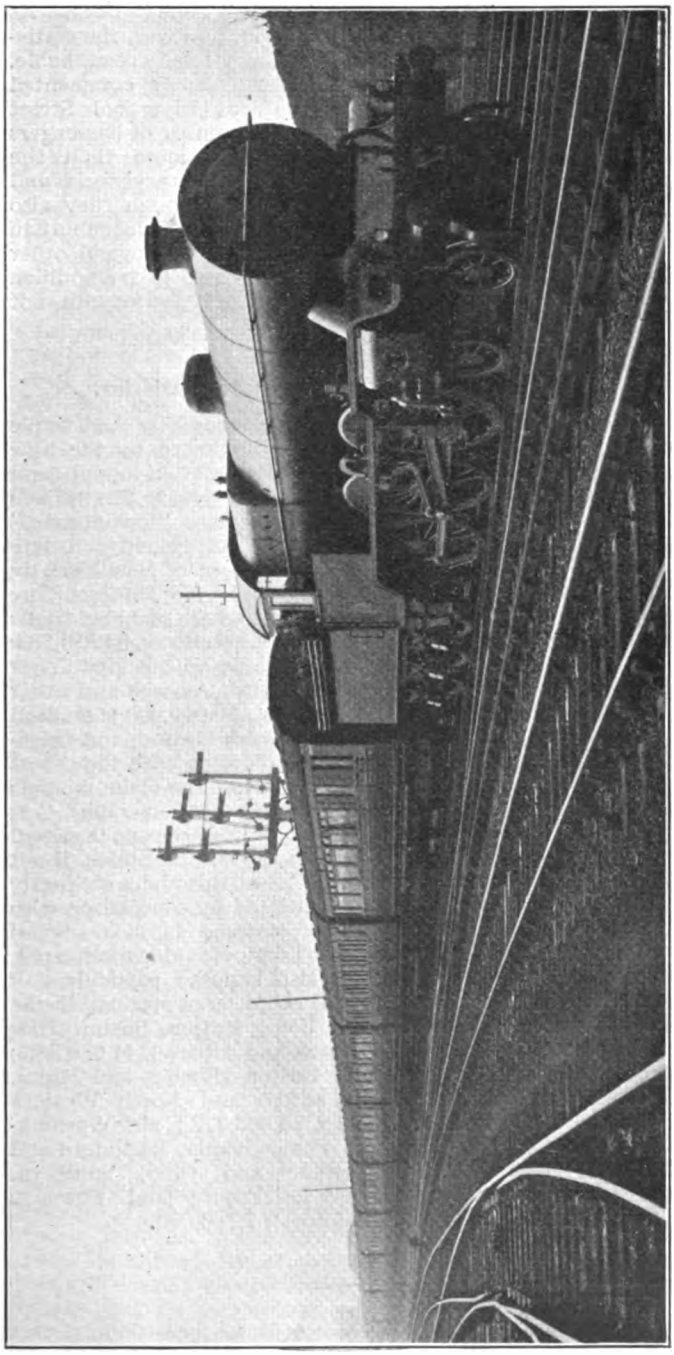
is provided for 55 passengers seated, with considerable space for standing passengers at times of pressure. The car is designed so that it can haul a trailer carriage accommodating 60 passengers seated. It is not intended to add further trailers, but to replace the car by an ordinary train when the traffic is sufficiently heavy.

South African Railway Side Shows.

THE Union of South Africa now administers late German West Africa, and the South African Railway Administration works the railways in this annexed German territory. There are 968 miles of 3 ft. 6 in. gauge railway and 475¼ miles of 2 ft. gauge line. Of the 2 ft. gauge line, 104¾ miles are privately owned, but the South African Railway Administration works 6¾ miles of the privately-owned lines. There are but two ports in this vast territory, which has a coast line of about 700 miles. Of these ports Walvis, with Swan Kopmund, is the chief, but the rough seas prevalent make it unpopular with shipping. The other port, Luderitzbuchl, generally called Luderitz, is about 260 miles further South, adding to the time and cost of voyages to and from Europe. Luderitz does not suffer from adverse seas, but is situate where fresh water is unobtainable! The South African Administration has, therefore, to provide fresh water by condensing sea water. During the past year, 3,168,792 gallons of sea water were condensed at Luderitz; of this total 1,618,326 were sold for town use, and 274,535 gallons to various Government departments, leaving 1,275,931 gallons, which were used by the railway administration.



LONDON MIDLAND AND SCOTTISH RAILWAY
Four-cylinder 4-6-0 locomotive No. 1662 lettered "L.M. & S.R." on tender.

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The Bristol and Exeter Railway.

SUGGESTED by replies already given in the "Why and the Wherefore" section, "C. R. C." writes as follows:—"While I was in one of the booking offices of a station on a branch of the Great Western Railway (formerly Bristol and Exeter), I was shown a book of written First Class Return Tickets, with the title of the Bristol and Exeter Railway Company embossed above. Of a book of 50, only 7 had been issued, the last one in July, 1908, and the first one in February, 1870. I was further informed that if such tickets were required, one of these would still be issued. The occasions are so rare that one book lasts the lifetime of a station, even when the railway company is extinct. Concerning other traces of the Bristol and Exeter Railway, the station furniture (tables and chairs) are carved with 'B. and E.' on them; the goods sheds, bridges and culverts still remain in good condition. At Sandford and Congresbury stations there exists quite a quantity of solid mahogany furniture, of pleasing design, excellently carried out. The goods sheds, constructed of limestone conglomerate, are strongly built, and are much more solid than those built in later years At several stations, also, exist the original. account books of the Bristol and Exeter Railway Company, showing that their returns were all made up monthly instead of weekly, as is the case nowadays." "C.R.C." also suggests that the Great Western Railway might advisedly take steps to have relics of this class preserved and collected at headquarters, as matters of historic interest. He also mentions that a bell, once the property of the Bristol and Exeter Railway, is now preserved in the signal cabin at Axbridge (Somerset) as a relic of early days.

Railway Traffic in New York.

THE New York Transit Commission has collected and published statistics of passenger traffic at the principal railway stations in New York. In this connection we may also refer to corresponding particulars supplied by Mr. .E J. Pearson, President of the New York, New Haven and Hartford Railroad. The Pennsylvania terminal, including trains of the Pennsylvania, Long Island, Lehigh Valley and New Haven lines, led with a total of 36,866,815 passengers. Next came the Grand Central Terminal (New York Central and New Haven lines) with 36,157,012 passengers, followed by the Flatbush Avenue station of the Long Island Railroad, with 32,893,995. These figures apply only to traffic on main lines and suburban services thereon. Obviously the Interborough, Elevated and other lines would have more remarkable figures, against which might be set, in comparing with London, the equally notable traffic statistics of the London "Underground" and "Tube" lines. As compared with London, however, the statistics given above are not specially remarkable. Sir Henry Thornton recently commented upon the fact that, at Liverpool Street station alone the total number of passengers in 1921 was 76,136,823, more than the combined totals of the Pennsylvania and Grand Central terminals, though they also include a similar large proportion of suburban as well as main line traffic. Several other London termini would record 40 or 50 million passengers, though exact figures are not available.

Other New York Traffic Statistics.

OTHER and miscellaneous New York traffic statistics of interest published by the New York Transit Commission are: to and from New York on the New Jersey side, 220,847,049 (of these 148,958,292 were "commuters" or had zone, trip or other reduced fare tickets); traffic in and out of New York by railroads and ferries, 273,468,269 (including 201,579,512 "commuters," &c.); traffic on Hudson & Manhattan Railway, 94,559,352; total Long Island traffic within New York City (including Flatbush Avenue and other traffic covered above), 70,000,000; Hudson Terminal (a rapid-transit station, and therefore not strictly comparable with the others mentioned), 59,221,354. The claim is made that Flatbush Avenue station ranks "as the greatest trunk railroad terminal served by a single road in the United States, if not in all the world;" but this claim obviously cannot be substantiated by comparison with Liverpool Street station, as also several other terminals in London, as above indicated.

Mr. Pearson also supplies particulars of traffic at several other large stations in the United States: South station, Boston (New Haven and Boston and Albany), 41,676,866; North station, Boston (Boston and Main), 31,528,016; Chicago and North Western station, Chicago, 23,902,772; and Washington Terminal (Pennsylvania, Baltimore and Ohio, Chesapeake and Ohio, Southern, Richmond, Fredericksburg and Potomac and associated lines), 7,796,000.

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MR. W. A. PATERSON, M.Inst.C.E., Engineer-in-Chief, Caledonian Railway, has retired after 43 years' service. Born at Perth, he served as a pupil with his father, who was a well-known railway engineer. He afterwards joined the engineering staff of the Northern Division of the Caledonian Railway at Perth, and was subsequently appointed Engineer to the Perth General Station Committee. In 1897 he became Engineer for the Southern and Eastern District of the railway at Edinburgh, where he remained until 1910, when he succeeded as Engineer-in-Chief at Glasgow, Mr. Donald A. Matheson, M.Inst.C.E., who had been made General Manager. Since then Mr. Paterson, in addition to being responsible for the maintenance of the whole railway, has carried out important new works as well as rebuilding several important stations and large viaducts. Mr. Paterson is a member of the Institution of Civil Engineers, a Past-President of the Glasgow Association of Students of the Institution, and a Major in the Engineer and Railway Staff Corps, R.E. (T.A.).

MR. W. A. PATERSON, M.INST.C.E.,

Engineer-in-Chief,
Caledonian Railway, 1910–1922.

* * *

SIR HERBERT A. WALKER, K.C.B., has been appointed Chairman of the General Manager's Conference at the Railway Clearing House for the year 1923. Sir Herbert began his railway career with the London & North Western Railway in 1885. On January 1, 1912, he became General Manager of the London and South Western Railway and on the outbreak of war in 1914 he was made Acting Chairman of the Railway Executive Committee. He continues with the Advisory Committee associated with the Ministry of Transport.

* * *

MR. R. J. MOORE, Superintendent of the Line, Great Northern Railway (Ireland), has been elected chairman of the Traffic Officers Committee at the Irish Railway Clearing House for the present year. Mr. Moore began his railway career in the service of the old Irish North Western Railway

* * *

MR. A. E. MCCLOSKEY, who has been called to the Bar after having completed 30 years' service on the engineering staff of the General Post Office, London, has had considerable experience in connection with signalling work on railways, having been successively "loaned" by the Postmaster General to the Midland (N.C.C.) Railway, the Bombay, Baroda and Central India Railway, and the Ceylon Government Railways. He has also been attached to the engineering staff of the Commonwealth Government of Australia. His work has been largely in connection with electrical aspects of railway signal engineering, and he was in charge of electrical train signalling in connection with the Delhi Durbar in 1911. He has been associated with a number of official investigations.

* * *

MR. H. R. CRIPPS, who has been appointed Chief Assistant Solicitor, London and North

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Eastern Railway, was born in 1873, and educated at Winchester. He was articled to Murray, Hutchins & Co., and was for some time in the Chambers of the late Lord Moulton. In 1897 he joined the firm of Dyson & Co., and became senior partner in 1913. Mr. Cripps joined the army in February, 1915, and attained the rank of Major. He served on the staff as D.A.Q.M.G. until August, 1919, and joined the Ministry of Transport as Assistant Solicitor on its formation. Mr. Cripps was closely identified with the passing of the Railways Act in 1921, and after the relinquishment of the office of Solicitor by Sir Francis Dunnell in 1921, was Acting Solicitor.

* * *

On his retirement from the position of General Manager of the Midland Railway at the end of 1922, Mr. Frank Tatlow, C.B.E., was presented by the staff with a gold watch and a gold and platinum albert as a token of the high esteem in which he was held. Mr. Tatlow warmly thanked the staff for their generous gift, which he would henceforth wear with pride so long as he lived. He gave an interesting account of the department as it was when he entered it in April, 1875; there were no fixed hours or holidays, or routine, and during the first seven or eight years of his railway life, he averaged 12 hours for a working day. Such a training was, in his opinion, the best one could have. The thing he was most frightened of was getting into a groove, and his advice to the young people round him was to get hold of as much work as they could, and of as varied a character as was possible.

* * *

At the invitation of Sir Sam Fay, the General Manager, the officers of the Great Central Railway, joined in a farewell gathering and dinner on December 30, to mark the passing of the Great Central Railway and its merging into the London and North Eastern Railway. In proposing the health of Sir Sam Fay, Mr. J. Rostern (Chief Goods Manager) referred to the happy relationship which had always obtained between the officers and their Chief during the 21 years Sir Sam Fay had been general manager. In reply, Sir Sam Fay spoke in high terms of appreciation of the assistance and support which he had at all times received from the officers. He briefly recapitulated the stages in Great Central progress to the position which it had attained, and proposed the toast of the London and North Eastern Railway, expressing the hope of all present for the success and progress of the new undertaking. This was supported by Mr. Dixon H. Davies, the Solicitor to the Great Central Railway. Speeches were made by a number of the officers, including Mr. J. G. Robinson, Chief Mechanical Engineer; Mr. E. A. Clear, Assistant General Manager; Mr. W. Clow, Superintendent of the Line; Mr. H. Blundell, Chief Engineer; Mr. R. Rigby, Chief Accountant; Mr. C. W. Neele, Electrical Engineer; and Mr. F. M. Barwick,

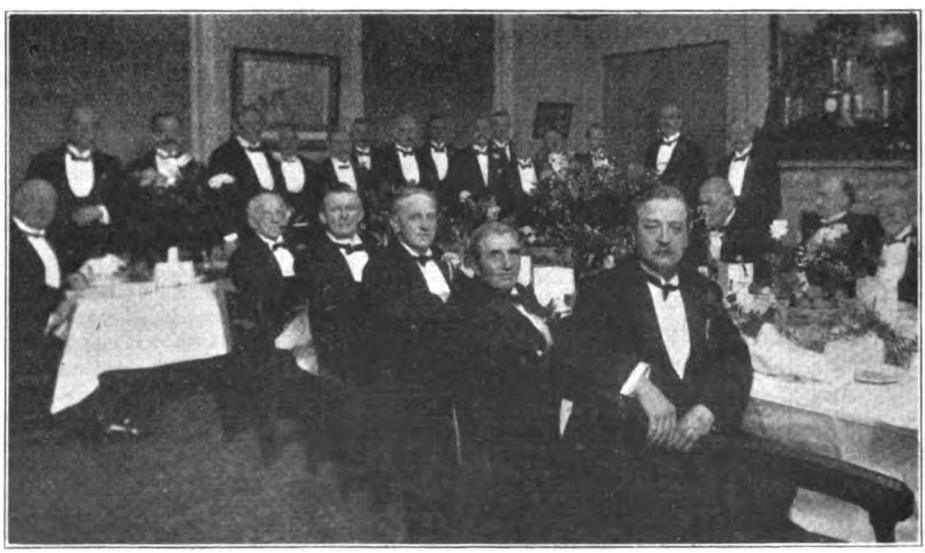

Photo.] [*Elliott & Fry.*

GREAT CENTRAL RAILWAY OFFICERS FAREWELL DINNER, DECEMBER 30, 1922.

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Port Master; and Messrs. Clear, Neele and Puleston contributed to the enjoyment of those present by musical selections. One of the features of the gathering was the introduction on the front of the menu card of the facsimile of buffer stops with the sun setting in full glory, and underneath the word "Finis," symbolical of the merging of the railway into a bigger undertaking, with the prospect of a bright and promising dawn.

* * *

UNDER the chairmanship of Mr. J. H. Matthews, the second annual dinner of the Great Western Railway Police Force was held on January 5, at the Hotel Great Central, when a company of 300 officers and guests—including Mr. Felix J. C. Pole, the company's General Manager—were present. The officers were drawn from every part of the system, including the recently-absorbed Welsh lines.

* * *

MEMBERS of the Metropolitan Conference of Railway Companies met at Liverpool Street Hotel on January 5, on the occasion of a complimentary luncheon, followed by a presentation, to Mr. F. W. West, O.B.E., who recently retired from the position of London District Goods Superintendent of the South Eastern and Chatham Railway. The chair was occupied by Mr. Percy Syder, London Commercial Superintendent of the London and North Eastern Railway (Great Eastern Section), who said that the members had met to do honour to an old colleague for whom they had the highest admiration and respect. He referred to the long and varied career of Mr. West, whose railway service commenced with the Lancashire and Yorkshire Railway 48 years ago, and expressed the appreciation felt by all the members of Mr. West's genial personality, and of the capability and courtesy which had characterised all his associations with the business of the Conference. Mr. H. Humphriss (London, Brighton and South Coast), the "father" of the Conference, Messrs. L. Brightman (Great Northern), F. D. Antill (Midland), F. S. Bridge (London and South Western), E. E. Painter (Conference Secretary), and others present also assured Mr. West of their appreciation of his many qualities. The chairman then asked Mr. West to accept an easy chair and adjustable reading table, with the very best wishes of the members, and their sincere hope that he would long be spared to enjoy the rest which he had so thoroughly earned. Mr. West suitably responded.

* * *

ON January 1, *The Financial Times*, which claims to have the largest circulation of any financial journal in the world, issued a special railway supplement. The demand was so great a reprint was put in hand and copies may be obtained through newsagents or bookstalls at twopence each. Among the contributors to the supplement appear the following prominent railway officers:—Sir Herbert Walker, Sir Sam Fay and Messrs. Felix J. C. Pole, R. L. Wedgwood and R. H. Selbie, while from the pen of the well-known expert, Mr. W. J. Stevens, there is included an authoritative article entitled "Present and Future Finance of British Railways."

* * *

IN an article in an American periodical, *Engineering News Record*, referring to Sir Henry Thornton, formerly General Manager, Great Eastern Railway, but now the premier officer of the Canadian National lines, the hope is expressed by Mr. Felix J. C. Pole, General Manager, Great Western Railway, that England has not seen the last of Sir Henry, and Mr. Pole observes that, situated as he is, midway between Great Britain and the great dependencies of Australia and New Zealand, and with his broad outlook on men and things, "no one could be better fitted than he to inaugurate an English-speaking railway congress—a movement which would have a wide appeal and a very great measure of usefulness."

* * *

AT the January meeting of the Institute of Transport Metropolitan Graduate and Student Society, a lantern lecture on "Advertising in Transportation" was given by Mr. F. H. Stingemore, of the London Electric Railway. In Mr. Stingemore's hands the subject was by no means dull, and the frequent applause with which his remarks were punctuated showed that he was appreciated by his audience. Among Mr. Stingemore's observations were "Advertising oils the wheels of transport." "A journal which circulates among the 'upper ten' is worth more than a periodical with a mixed circulation, though the 'net sales,' of which we have heard so much, may be the same." "Advertising in a technical journal," remarked the lecturer, "has one advantage over newspaper work: a technical journal is usually perused more carefully and leisurely than a daily paper, and is retained for a much greater length of time." At the conclusion Mr. Stingemore was thanked by the chairman, Mr. Alfred H. Archer, who started the debate, which was taken up by Messrs. E. W. Bayliss, W. Collins, Savidge and Chalk.

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At the recent exhibition of engineering models at the Horticultural Hall, Westminster, Messrs. John I. Thornycroft & Co., Limited, exhibited a model of a locomotive made in 1848 by Thomas Thornycroft, father of the founder of the company mentioned. The model, being of great historical interest, attracted considerable attention.

* * *

At the stand of the Leeds Model Co., Ltd., at the Model Engineering Exhibition, pride of place was given to a very fine super-detail model of Great Northern Railway 4–6–2 "Pacific" locomotive, No. 1470. The finish of this model is of the highest order, but the valve gear attracted particular attention. This is of correct Walschaerts type, exactly as on prototype, and complete in every way. The radius-rods shift in the links automatically when the engine is reversed. Coupling-rods, connecting-rods, eccentric-rods, &c., are fluted, and all parts are nickel-plated.

* * *

A prominent and much-inspected feature at the Model Exhibition was a very fine small scale permanent-way lay-out in 2 in. gauge, consisting of an up and down double road with a double scissor cross-over connecting all roads. The lay-out occupied the whole of the back of the stand allotted to that far-famed firm, Messrs. W. J. Bassett-Lowke, Ltd., of London, Northampton and Edinburgh. There were several new locomotives on view, including a steam tank in gauge 0, with piston valve cylinders and reversing motion. The general arrangement of the stand received much favourable comment, stocked as it was with specimens of Bassett-Lowke's different departmental outputs, such as tinplate goods, wooden rolling-stock, ship's fittings, engine and boiler fittings, waterline models and locomotive castings. In addition to the stand the firm had ½ in. scale and 1¼ in. and 1½ in. gauge clockwork, steam and electric locomotives running on a trade track at stated intervals. Here, too, a feature of intense interest to wireless enthusiasts, was the wireless control of an electric train by means of a special device made by Major Raymond Phillips and demonstrated by him in conjunction with Messrs. W. J. Bassett-Lowke, Ltd.

* * *

"Not only is Mr. Bassett-Lowke a model manufacturer, he is also a model lecturer," was the remark of one of the speakers at the close of a very entertaining evening at the Railway Club, 65, Belgrave Road, S.W.1, on January 12. With Mr. Cecil J. Allen, in the chair, a very able lantern lecture had been given by Mr. W. J. Bassett-Lowke (Northampton), his subject being "Railways in Miniature." By special request Mr. Bassett-Lowke did not restrict himself entirely to model railways and locomotives, but dealt with shipping, factories, war-models, and kindred interests. A vote of thanks proposed by Mr. W. Parker was carried with acclamation. The annual meeting of the members of the club is to take place on Friday evening, February 9, when an address will be given by Mr. Cecil J. Allen.

* * *

Our Crewe correspondent reports: An order for thirty 4 ft. 3 in. side-tank shunting engines, similar generally to the existing 0-8-2 type engines, but having the 0-8-4 wheel arrangement, and "G2" class boilers, is now being proceeded with at Crewe, but none has been put in hand as yet.

No. 374 *Empress* is the latest "Precursor" class locomotive to be converted to superheater, and assimilated to the "George the Fifth" class.

Recent cut-ups include the 4-4-0 compound No. 1976, *Lady Godiva*. Others are: Nos. 380, *Quernmore*, and 1677, *Badajos* ("Precedent" class); No. 782 (0-6-2 tank), Nos. 3079 and 3149 (Special Dx goods), and No. 3077 (Special tank shunter).

During 1922 a total of 69 new engines were added to the stock, comprising 29 4-6-0 "Prince of Wales" class, and 40 goods engines of the 0-8-0 superheater, or "G2" class. Only the latter were constructed at Crewe, the 29 "Princes" being supplied by Messrs. Beardmore & Co., and were the last of an order for 90 engines.

From the Horwich works (Lancashire and Yorkshire Section) there is now being turned out a new series of 4-6-0 four-cylinder passenger engines, of which two, Nos. 1659 and 1660, are in service, and stationed at Blackpool. The up morning Belfast boat train, which is usually hauled by an engine of similar type, was recently brought into Crewe by one of the 4-4-2 "Atlantics," No. 1421, this being the first occasion, it is believed, on which the train in question has been worked to Crewe by an engine of the "Atlantic" type.

* * *

From Church, Lancs., Mr. R. Hogan wrote on January 6 as follows: "One of Mr. Hughes' superheater 4-6-0 (late Lancashire and Yorkshire Railway) locomotives caused quite a sensation this morning when hauling a Blackpool to Accrington train, by appearing with the initials of the London Midland and Scottish Railway upon its tender in gold letters." *See* page 167.

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"FURNESSIAN" sends particulars of the working of 4-6-4 tank engines now in use on the Furness line. The five turns operated from Barrow, where all these engines are stationed, are as follows:—(1) 5.46 a.m. Mail, Barrow-Whitehaven; 10.15 p.m., Slow, Whitehaven-Barrow. (2) 2.50 p.m., Slow, Barrow-Whitehaven; 7.5 p.m. Mail, Whitehaven - Carnforth; 11.5 p.m., Semi-fast, Carnforth-Barrow. (3) 1.5 p.m., Fast, Barrow-Carnforth; 4.20 p.m. Semi-fast, Carnforth-Barrow; (4) 4.20 p.m. Fast, Barrow - Carnforth; 6.25 p.m., Slow Carnforth-Millom. (5) 4.55 p.m., Slow, Barrow-Carnforth; 7.0 p.m., Semi-fast, Carnforth - Barrow. There is also a further duty taken by the engine of No. 4 turn, but in charge of second link men, the 9.15 a.m. semi-fast from Barrow to Carnforth, and the 12.10 p.m. slow train from Carnforth to Barrow. Several of the turns mentioned include incidental journeys, as working local trains between Ulverston, Barrow and Millom. When any of the 4-6-4 tank engines are not available, two of these turns are sometimes worked by the same engine, with different men, as, for example, Nos. 1 and 5. A number of trains have been considerably expedited, particularly those of a stopping character. Thus, the 9.53 a.m., 1.30 and 4.20 p.m. Carnforth-Whitehaven trains complete their journeys in 15 or 20 min. less than the corresponding trains a year ago, although the same stations are served. Furness Railway coaching stock is used for the through services between Whitehaven and Barrow and Manchester (Victoria).

* * *

FOR the "January Sales" season the London Electric Railway issued a poster of characteristic design by McKnight Kauffer. The picture very effectively illustrated the atmosphere of the "Winter Sales," best reached by "Underground."

* * *

IN the great farming area of Alberta, Saskatchewan and Manitoba, the Canadian Pacific Railway owns some four million acres of the finest land. The Company is now offering this land for sale at prices ranging from £3 10s. per acre, freehold, the purchase price may be spread over a period of years if desired. The Canadian Pacific is not a land-selling organisation in the ordinary sense of the word. Its chief business is to handle railway traffic, and in order to produce traffic, it desires industrious, successful settlers along its lines. For that reason it is able to give the most favourable terms and assistance to the settler. Booklets containing full particulars of the lands and giving the acreage and yields of the leading crops, the average temperature and rainfall, &c., over a period of years, may be obtained free by applying to the Land Department, 62-65, Charing Cross, London, S.W.1.

SOUTHERN RAILWAY'S NEW POSTER.

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FOLLOWING the incorporation of the Isle of Wight railways in the Southern Railway, second-class bookings have been discontinued in the island. Carriages lettered "Second-class" are available for third-class passengers, and second-class season ticket holders are requested to arrange for transfer to first or third-class.

* * *

RE-GROUPING of the railway systems is an event which affects everybody. Without a specially coloured map, it is impossible to visualise the changes, and the new Railway Map of the British Isles which will be published during February by Messrs. George Philip & Son, Limited, 32, Fleet Street, London, E.C.4, will meet a decided want. The size of the map is 33 in. by 42 in., and it will be issued in various styles of mounting, the cheapest form of which will probably be 2s. 6d., folded in case, pocket size.

* * *

THERE has been a fair demand for properties during the past year in the three estates controlled from Baker Street station, London, comprising the Metropolitan Railway Surplus Lands, the Metropolitan Railway Country Estates, Limited, and the Wembley Park Estate Company, Limited. The total sales for the year amounted to £91,927, made up as follows :—Sales of land, £36,132; sales of houses, £28,005; sales of ground rents, £12,840; and shops and business premises, £14,950.

* * *

AN informative map has been issued by the "Underground" companies showing the new connections and the through routes which will thus become available when the connections between the City and South London and London Electric Railways at Camden Town, and the Hendon and Edgware line, are completed; also the Wimbledon and Sutton line, and the extension of the City and South London Railway to join therewith, and the new connections at Kennington station, for which Parliamentary powers are being sought. The map shows in colours the varying situations of each part of the project, classified as: Reconstruction and works in hand; proposals in 1923, Parliamentary Bills; work for which powers have already been obtained, but not yet in hand; and stations (Leicester Square and Piccadilly Circus) which are to be reconstructed. We have already described most of these proposals, but it is worthy of note that completed alternative routes, either via Charing Cross or via the Angel and Moorgate, will be available right through from Edgware to Sutton, while the latter destination will be reached also by Metropolitan District trains extended beyond Wimbledon. The new connection between the London Electric Railway and the City and South London Railway at Kennington will add very materially to the facilities already available, while the extension of the City and South London line beyond Clapham Common will open up a district somewhat inadequately served by railways.

* * *

DURING the past few months much havoc has been wrought on the railways in Ireland by armed raiders, but the destruction of the railway station at Sligo has appealed most strongly to popular imagination in Great Britain. Before saturating the buildings with petrol and mining the walls, the wreckers coupled up seven powerful engines and sent them headlong under full steam. The locomotives crashed through the massive concrete sea wall and one plunged into the sea.

* * *

LORD MONKSWELL has patented a new design of rail-joint. Briefly stated the invention is a rail-joint for railways wherein a suspended joint derives additional support from one or more auxiliary rails placed parallel to and spaced from the running rail and secured by chairs to at least two sleepers on each side of the rail-joints.

* * *

IN order to improve public facilities at Westminster "Underground" station, important alterations are now being put in hand. The space at present occupied by Messrs. Lyons & Co. is to be incorporated into a large circulating area, equipped with "Passimeter" booking appliances and automatic ticket machines. The portion of the subway which at present leads direct to the House of Commons is to be thrown into this area, and the public entrances as a whole re-designed and widened, with new staircases, &c. The present booking office and store room on street level will be cleared right away. Staircases at present obstructing the westbound platform will be put further back in order to give additional platform width at certain points. Messrs. Lyons & Co. have purchased the adjoining property, and will connect this up with the buildings over the station, thus providing one large restaurant. No alterations are to be made in regard to the second entrance to the station direct from the Embankment. It is probably not generally known that, in addition to the subway leading direct to the Houses of Parliament, there is a subsidiary

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passage leading to Westminster Pier, also providing an entrance to St. Stephen's Club.

* * *

FOLLOWING on the recent conference between the Prime Minister and the General Managers of the various railways in connection with the Government scheme for the relief of unemployment, the London Midland and Scottish Railway proposes to put in hand works estimated to cost about one and a quarter million pounds. Among the principal works are the widening of the Manchester to Normanton Railway at Mirfield, and between Horbury and Wakefield. In connection with the former a viaduct will have to be built across the River Calder and adjacent roads, while the latter will necessitate the building of 12 new bridges, the opening out or reconstruction of a tunnel, and considerable excavation. St. Annes-on-Sea and Thornton stations are to be remodelled, and additional facilities provided, while works are to be put in hand at Bangor, Llandudno and Rickmansworth, to which latter point the electrified line from Watford is being extended. Other works now in hand include the deepening of Holyhead harbour, alterations at Walsall station, the building of several new bridges, and the provision of additional accommodation at Darlaston.

* * *

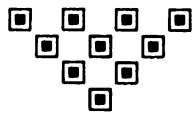
MUCH public interest has been shown in the formation of a company, to be known as the Great Eastern Train Ferries, Ltd., the collaborating Belgian company being La Société Belge-Anglaise des Ferry Boats, for operating a train ferry service between Harwich and Zeebrugge. At Harwich a berth for the train ferry steamers is to be provided adjacent to the pier which was used for Great Eastern Railway Continental steamers before they were transferred to Parkeston Quay. The cost of this is estimated at about £60,000. At Zeebrugge a new jetty is to be built, and the anticipated cost is about 1,000,000 francs. It is intended to utilise the train ferries which were operated between England and France for the conveyance of war material, and especially locomotives and heavy rolling-stock. Agreements have been completed between the company and the London and North Eastern Railway. The latter company will operate the boats, and will also deal with the traffic on this side. In Belgium the Belgian State Railways will operate the traffic, besides providing and maintaining a stock of wagons built during the war, and designed so that they can run on either British or Continental railways. It is expected that the service will be in operation by August next. The capacity of each train ferry vessel is 54 wagons. Lord Ailwyn, late Deputy-Chairman of the Great Eastern Railway, who is one of the four directors of the Great Eastern Railway nominated to the board of the London and North Eastern Railway, has been appointed by the latter as their representative on the board of the company.

* * *

BOTH the Trieste Lloyd (Lloyd Triestino) and the "Sitmar" Lines have now reduced their passage rates to Egypt, and the former company also to Bombay and the Far East. In addition, there are special reductions granted on through bookings from London, including the overland journey to Trieste, Venice, Genoa or Naples, as the case may be. The rates from London are now £43 first, and £29 10s. second class to Egypt, and £70 first, and £54 second class to Bombay.

* * *

IN connection with the extension of the Hampstead Line from Golders Green to Edgware, the Underground Company have placed a contract with Sir William Arrol & Co., of Bridgetown, Glasgow, for a steel bridge at Queen's Road, Golders Green, and steel bearings for the bridges at Elm Croft Crescent, Woodville Road, Highfield Avenue and Shirehall Lane. The amount of the contract is £799.



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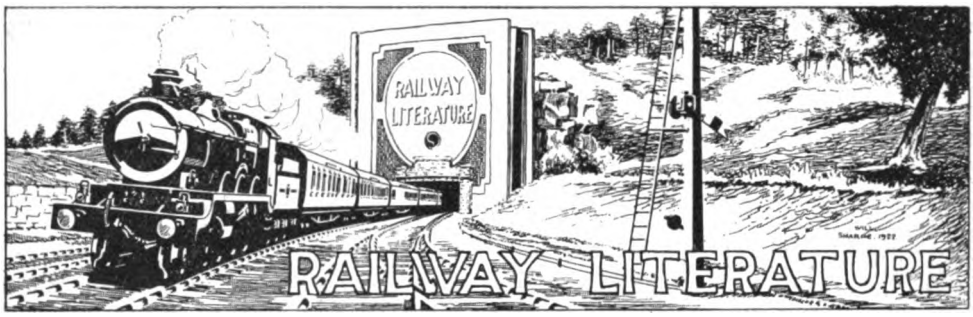

RAILWAY SIGNALLING: AUTOMATIC. By F. Raynar Wilson. [Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, London, W.C. 2 Price 2s. 6d. net.]

This addition to Messrs. Pitman's well known series of technical primers is described as "An introductory treatment of the purposes, equipment, and methods of automatic signalling and track circuits for steam and electric railways," prepared for railwaymen, students and others. The author, who is an assistant engineer on the Victorian Government Railways, is a son of Mr. H. Raynar Wilson, well known as an authority on railway signalling problems, and by whom a foreword is contributed. Chapter I deals with the purposes and advantages of automatic signals. Chapters II and III describe track circuits for steam and electric railways, respectively. Chapter IV discusses the location and placing of automatic signals, while Chapters V to IX deal with various types of equipment, electro-pneumatic, electro-gas, low-pressure pneumatic, all-electric two-position and all-electric three-position signals. Chapter X discusses various types of light signals. The ground is very well covered in an interesting and authoritative manner, as far as the space available will permit, while the 114 pages of text are assisted by 75 illustrations, half-tone or line. A useful bibliography is added, and there is a very complete index. The volume may be cordially recommended to all desiring to obtain a good basis of general knowledge on this important subject.

THE WONDER BOOK OF WONDERS. Edited by Harry Golding, F.R.G.S. [Ward, Lock and Co., Limited, London and Melbourne. Price 6s.]

As a gift book for the young this is a charming production containing 12 colour plates and nearly 300 other illustrations. For his motto the editor has inscribed upon the title page :—

"Oh, here and there is Wonderland
And anywhere will do."

Right well has he acted up to this and as the world is full of wonders and so likewise is the air around it, to say nothing of the glories of the starry firmament above, he has had a wealth of material upon which to draw and he has not failed to make use of his opportunities. The marvels of machinery, animated nature, great cities and peoples are all set forth in this "wonderful" book. The mysteries of railways, shipping and aerial transport are explained in language easy of comprehension and there are few subjects that appeal more strongly to juvenile minds. It is down-to-date, too, for it includes the wonders of wireless and further illustrates the controlling of tube trains by telephone. Bound in boards and including 256 pages, 9½ in. by 7 in., it is a very fine book.

INCOME TAX ASSESSMENTS, 1922–23. [By C. W. Nourse. Derby: James Harwood, Derwent Street. Price 9d.]

Mr. Nourse, who is a Fellow of the Corporation of Accountants and author of "The Income Tax Payers' A.B.C.," has issued a paper-bound sixteen-paged pamphlet dealing with assessments for the current year. It contains a very clear and easily understandable series of statements concerning the regulations now in force and it embraces special notes on the new basis of taxation of railway officials and salaried employees. As RAILWAY MAGAZINE readers are aware, by reason of a decision in the House of Lords in March last in regard to the case of a Great Western Railway clerk, the Government brought in legislation putting all employees of the class affected on the same basis. The recapitulation of the exact arrangements in force to-day is one of the principal objects of Mr. Nourse's pamphlet.

LUBRICATION AND LUBRICANTS. By J. H. Hyde. [Sir Isaac Pitman & Sons, Limited. Price 2s. 6d. net.]

This further addition to Pitmans' series of technical primers is described as "a concise treatise on the theory and practice of lubrication," or the "physical, chemical and mechanical properties and testing of liquid and solid lubricants." Notes are included on recent developments and examples from practice. In the course of eight chapters, 114 pages, and with the aid of 37 figures and 9 tables a good basis for further study of this important subject is afforded by this little volume. A bibliography and index are included.

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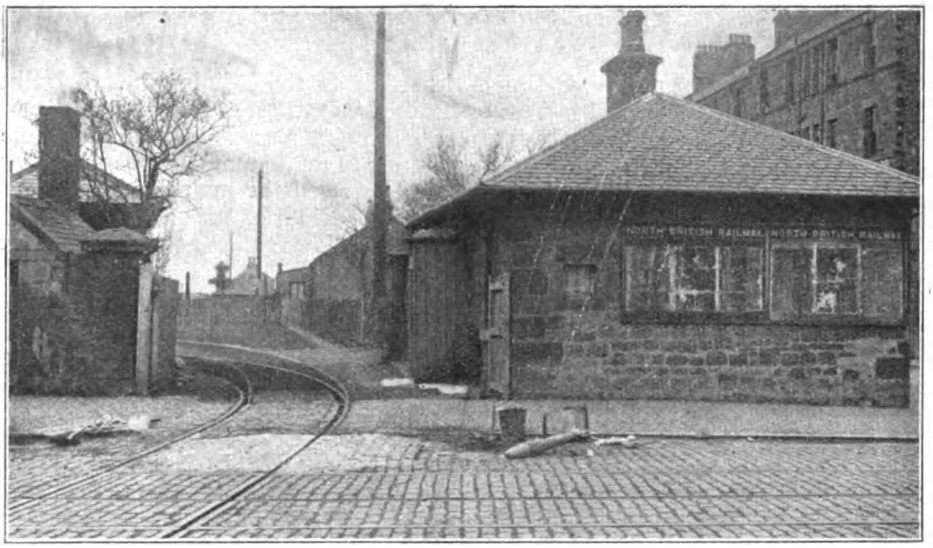

FISHERROW TERMINUS.

The Edinburgh & Dalkeith Railway.

By H. H. MEIK.

(*Photographs by J. C. H. Balmain.*)

THE inhabitants of North Britain have been proverbially cautious as regards spending the "Siller," but they were and are sagacious and persevering. They at first looked askance at the early schemes relating to railways, but when they became satisfied with the important results which were likely to accrue from their introduction they commenced operations in earnest, with the result that Acts were obtained in the twenties of last century for the Monkland and Kirkintilloch Railway in 1824, and the Ballochney, Dundee and Newtyle and Edinburgh and Dalkeith railways in 1826.

There never have been many passenger railways in Great Britain of any length that were worked by horses and perhaps the Edinburgh and Dalkeith Railway would provide a fair example of the very slight improvement in comfort, if any, which had taken place at that period between a horsed railway carriage and a well appointed four-horse coach. It was only when the locomotive came into its own and increased the speed of railway travelling that the four-horsed coach had to retire into oblivion.

The Edinburgh and Dalkeith Railway was incorporated under three separate Acts of Parliament, dated, respectively, May 26, 1826; June 4, 1829, and June 27, 1834. Under these Acts the company were empowered to raise the following amounts of capital: by the first Act, £70,125; by the second, £8,053 and by the third, £54,875, making together a total of £133,053.

The line as authorised by the above Acts ran from the then suburb of St. Leonards, Edinburgh, via Niddrie to the river South Esk, near Dalhousie Mains, having branches from Niddrie to Leith via Portobello and to Fisherrow, and also from the point now called Glenesk Junction to Dalkeith.

The St. Leonard's terminus was situated in the Newington district of Edinburgh, on the south east side of the City. From that point the line skirted the south side of Arthur's Seat, past the "Wells o' Wearie" to Niddrie Junction (now practically Niddrie West Junction). It then turned southwards past Millerhill and skirted the west side of the Policies of Dalkeith Palace. Then it crossed the River

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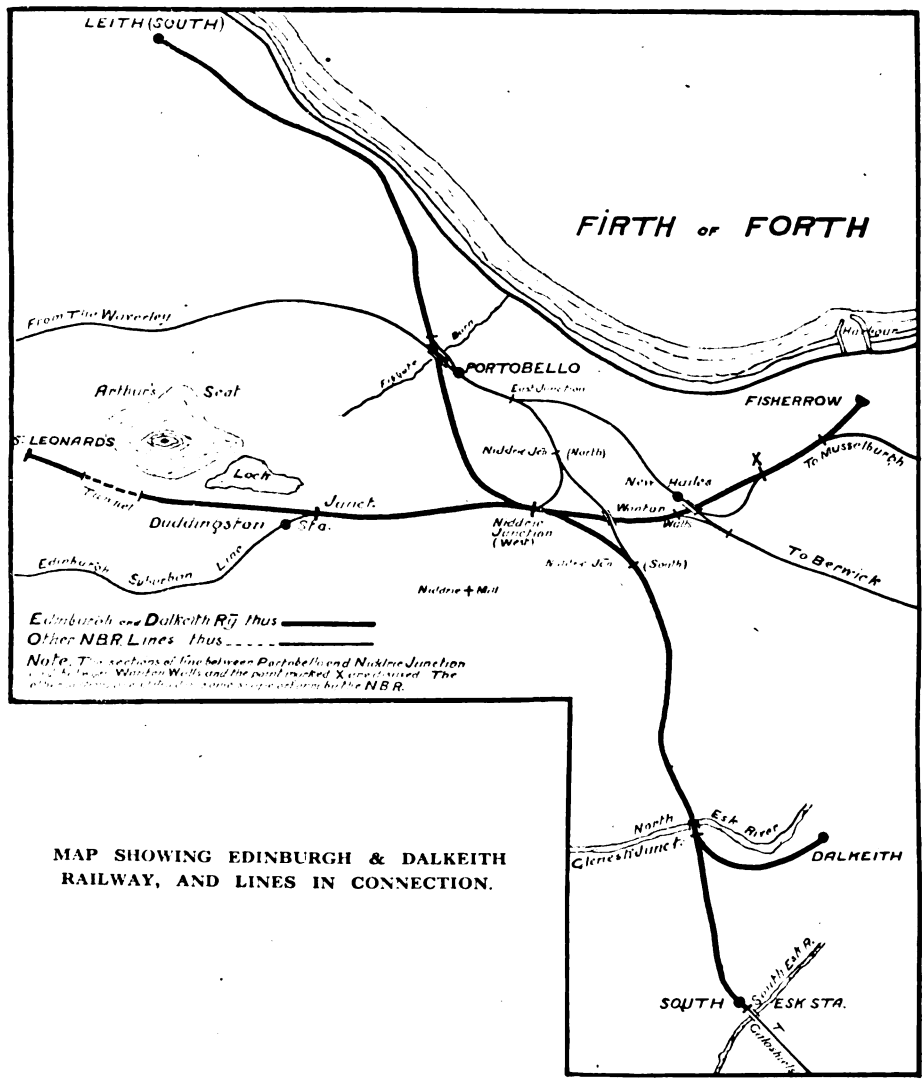
North Esk by a viaduct to Glenesk Junction, where the line to Dalkeith Town branched off. After the junction the line passed by Hardengreen and Newbattle, and terminated at the South Esk river, at a point afterwards known as Dalhousie and now as Newton Grange station.

leased it to the Edinburgh and Dalkeith Railway.

The Leith branch left the main line at Niddrie Junction and proceeding northwards crossed the main road from Portobello to Niddrie Mill and Edmonstone. It then followed the west side of that road



MAP SHOWING EDINBURGH & DALKEITH RAILWAY, AND LINES IN CONNECTION.

The short branch to Dalkeith from the junction is 40 chains long, and was constructed by the Duke of Buccleuch at his own expense, with a view to connecting Edinburgh with his extensive coalfields on the east side of the Dalkeith Policies. After the branch was constructed the Duke

as far as the Figgateburn, on the west side of Portobello station, crossing on its way the high road from Duddingston to Portobello. After passing Portobello the line ran under the Edinburgh and Portobello main road at Westbank bridge and passed through the Craigentinny Meadows.

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Following the south-west or landward side of the Leith and Portobello road, now known as the Seafield Road, for about three-quarters of a mile, the line crossed the road at Seafield crossing and continued on the north or seaward side to the terminus at or near Constitution Street, Leith.

The Fisherrow branch, which had a gradient of 1 in 52 downwards the whole way from Niddrie Junction to the sea, ran past what is now New Craighall, and then Wanton Walls, continuing alongside the road from Niddrie Mill to the Fisherrow terminus, situated at the south east corner of the angle formed by the meeting of the above road with the Portobello and Musselburgh high roads and Musselburgh High Street.

The main line from St. Leonards to South Esk was level for about half its length, the remainder having a rise and fall of 1 in 234.

On the Leith branch the line was level for about one-third of its length, the remainder having a fall of 1 in 300, excepting about 25 chains between the Figgateburn and Westbank bridge before referred to between which points the fall seawards was 1 in 69.

Length of the main line from St. Leonards to South Esk, which was double throughout, was approximately 8¼ miles. The Niddrie and South Leith branch was about 3¾ miles long, while the Fisherrow branch was a mile and three-quarters. The Dalkeith branch was 40 chains long as before stated. The section between Wanton Walls and the point marked X on the map, and that between Portobello and Niddrie Junction (West), are at the present time dismantled and disused, with the exception of about 20 chains at the Niddrie Junction end, which the railway company uses as a mineral depôt The part between St. Leonards and Duddingston Junction, 1 mile 57 chains long, is now single and used by the railway company supplying coal to the St. Leonards district.

The part between Duddingston and Niddrie (West) Junction, 1 mile 10 chains long, is used by the railway company as a part of their Edinburgh Suburban and South Side Junction line, while the section between Niddrie (West) and (South) Junctions is used by them as a coal and mineral line. The remainder of the line between Niddrie (South) Junction and South Esk, now forms part of the Waverley route to Hawick and the south. By the aid of a small loop at the north-west end of Portobello station the Leith section is also utilised by the company. This was originally a single line but was doubled some years ago. The part between Niddrie Junction and Wanton Walls has also been utilised by the company, as has also the small section of about 10 chains long, between the point marked X and a point where the present line to Musselburgh station branches off from the original line to Fisherrow.

The railway acquired the name of the "Innocent Railway" as it has been averred that during its existence as an independent company no human being had ever been killed on the line. As before stated, it was always worked by horses. Nobody was late for the trains as they would stop for any passenger in sight. Speed could not be called excessive as a traveller once timed a distance of 4¾ miles and found that it occupied 40 minutes. Drivers were forbidden to stop on the way and feed their horses under the penalty of half-a-crown, and boys ran on in advance to change the switches. The earth works were not heavy and the cuttings for the most part were through clay and sand. On the main line there were seven bridges over and four bridges under the line and six level crossings, "which are of less consequence on a horse line." On the Leith branch there were two bridges over and one under the line and two level crossings. The bridges were all built of stone and when over the line were of 24 ft. span.

There was one tunnel, 572 yards long, at the St. Leonards end of the line. It was semi-circular and built of stone with a spring of 20 ft. and cost £20 per lineal yard. It was lighted by 25 gas lamps and the cost of lighting the tunnel, workshops, and St. Leonards station was stated to be about £22 per annum.

At St. Leonards there was an incline or bank through the tunnel of 1 in 30 down to the East or Niddrie end. It was 1,160 yards long, the upper section being straight while the lower part was on a curve. It was worked by two low pressure condensing engines with cylinders of 28 in.

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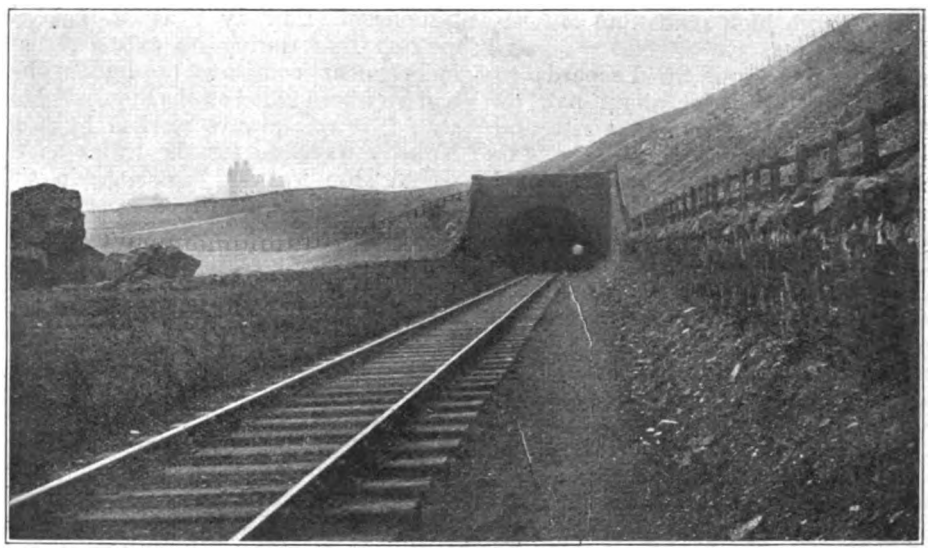
diam. by 78 in. stroke, the average working pressure being 5 lb. per sq. in. The rope roller was 11 ft. in diam., with a clear width of 3 ft. There were two 5-in. ropes, each weighing 37 cwt., the sheaves being 14 in. in diam. and 8 yards apart. The consumption of fuel was stated to be about 2½ tons per diem, and averaged about 4s. per ton, "being refuse" from a neighbouring colliery. The usual load for the stationary engines to draw up through the tunnel was about 30 tons gross, and the time occupied five minutes. The average duration of a rope was about three and a half years and the cost £36 per ton. From 130 to 190 wagons of coal were drawn up daily, the average quantity in each wagon being 2½ tons. On these trains there were usually three passenger coaches attached.

Weekly wages of the men employed in connection with the incline were: one engineman, £1 10s.; stoker with rooms and an allowance of coal, 17s.; two incline riders, 15s. each, and one signalman at the bottom of the tunnel, 16s. All these men had to do was to work eight trains into, and the like number out of, St. Leonards Depôt. There is a difference nowadays!

The gauge was 4 ft. 6 in., the intervening space or "six-foot way" being 4 ft. 10 in. with side spaces of 5 ft. 1 in. on each side. The embankments at the top were 24 ft. wide, while the whole width of the ground on the level was 30 ft.

Rails were fish-bellied in form, and were 15 ft. long and weighed 28 lb. to the yard. They came principally from the Bedlington ironworks, near Blyth, in Northumberland, and were set in chairs placed at intervals of 3 ft. and secured thereto with iron keys. The whole way was laid with freestone blocks measuring 24 in. × 18 in. × 8 in., broken whinstone being used for ballasting. The fencing consisted partly of low stone walls and partly of quickset hedges. The St. Leonards Depôt occupied about 8 acres, the station buildings being mere sheds of a poor description.



ST. LEONARD'S TUNNEL, FROM THE SOUTH.

Part of the original boundary wall can be seen on left.

South Esk station was erected in the cottage style and was of a neat design, with general and ladies' waiting rooms besides the stationmaster's room. There was also a detached stable for eight horses. Near by there was a long wooden bridge for carrying the Marquis of Lothian's railway over the River Esk. The Leith and Fishherrow termini appear to have been mere sheds.

Besides the terminal stations there was a half way stopping place at Niddrie Junction, at which carriages diverged for Leith and Fisherrow, and close by there

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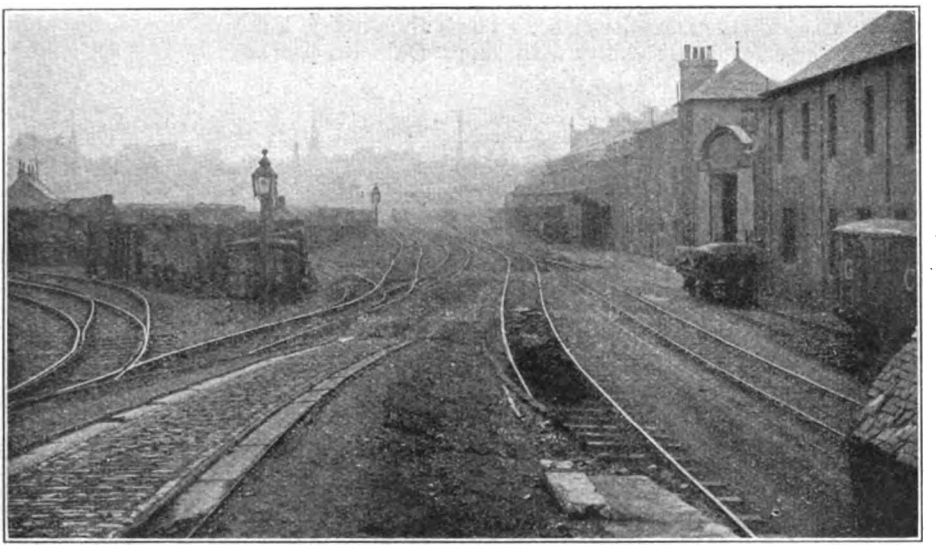
were large coal yards, connected with sidings. In the manager's office there was one book-keeper and one clerk. The out-door staff consisted of five collectors, with one assistant and three porters. The train guards were also constables, which was both economical and often convenient. Each guard carried a horn which he sounded loudly when necessary.

The carriage stock in 1840–1 consisted of 34 passenger carriages, 20 goods trucks and 80 coal wagons. The passenger coaches were of two kinds closed and open. The former were in three compartments holding eight persons in each compartment. There were three doors which



ST. LEONARD'S TERMINUS, FROM THE NORTH.

opened on one side only, the other side being entirely closed. There were seats both at the front and back of the coaches, each of which would hold four persons including the driver. A curved splash guard was fixed in front of the outside seats. The carriage body was 13 ft. long by 6 ft. 1½ in. wide and 4 ft. 4 in. high. The wheels were of cast-iron 2 ft. 8 in. in diam., and the weight was about 3 tons. The open carriages had no roofs and were divided into two whole and two half compartments, the former of which held eight persons and the latter four passengers. Between Fisherrow and St. Leonards an extra open coach was attached for the fishwives in the mornings, who when they went through the streets of Edinburgh drew the attention of the inhabitants by their various cries such as "Caller partan," "Caller haddie" and "Caller Ou."* According to an old timetable, dated 1842, the trains were as follows :—

From St. Leonards to Fisherrow and Dalkeith at 8.10 a.m., 10.10 a.m., and 2.10 p.m., 4.10 p.m. and 8.25 p.m.

From St. Leonards to Portobello and Leith at 10.10 a.m., 12.10 p.m., 2.10 p.m., 4.10 p.m. and 6.10 p.m.

From South Esk and Dalkeith stations to Edinburgh at 8 a.m. and 10 a.m., 12 noon, 2 p.m., 4 p.m., 6 p.m. and 8.10 p.m.

From Leith (Constitution Street) to Portobello, Edinburgh, Dalkeith and Fisherrow at 10 a.m., 12 noon, 2 p.m., 4 p.m. and 6 p.m.

From Fisherrow to Edinburgh, Dalkeith, &c., at 7.20 a.m., 8.20 a.m., 10.20 a.m., 12.20 p.m., 2.20 p.m., 4.20 p.m., 6.20 p.m. and 9.25 p.m.

The passenger trains usually consisted of three coaches, which were drawn from St. Leonards to the top of the tunnel by

* For those who do not understand the language of the "North Countrie," "Caller" is fresh, "partan" crab, and "ou" oyster.

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horses and also from the east end of the incline by the same method. Ascending the 1 in 69 bank near Portobello on the Leith branch, two horses were required for one carriage, a boy riding on the leader which was occasionally tripped and the boy "subject to sad accidents."

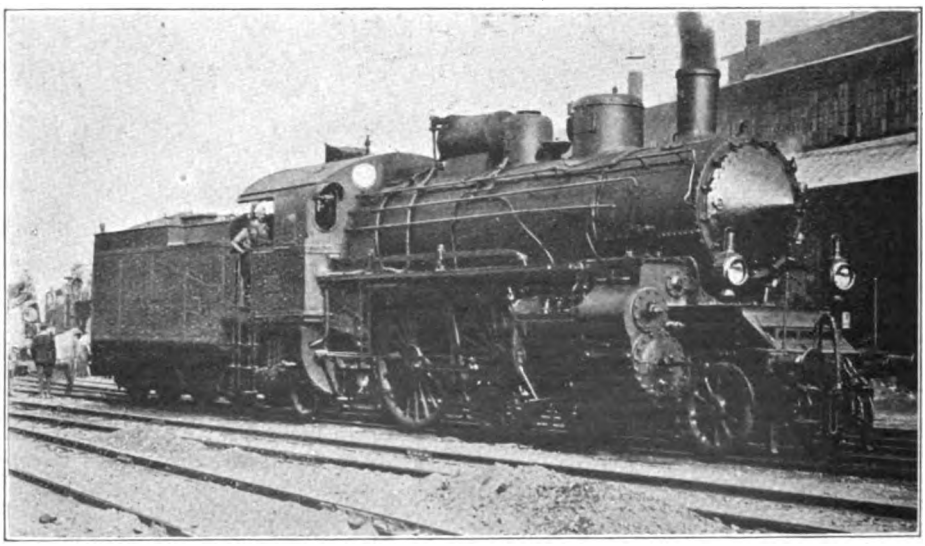
There were two guards on the main line trains and one on the Leith branch, the wages of each being 15s. per week. There were also 11 drivers each earning 12s. a week and three switch boys. In summer there were about 40, and in winter about 25 horses in use. Three of the horses were used at St. Leonards for shunting purposes

The cost of each horse was stated to be about £25 per annum and the usual load for one horse was four loaded wagons, amounting to about 14½ tons gross. The distance for each horse daily with one carriage was 12 miles, with an average speed of 8 m.p.h.

If a passenger train overtook a loaded coal train, it passed by the coal train at the first siding or cross-over it came to, but if the coal trucks happened to be empty the passenger train kept to the main line. The main line was opened for traffic in July, 1831, the Fisherrow branch in October of the same year, while the Leith branch was opened throughout in July, 1838.

The railway was acquired by the North British Railway under an Act obtained in 1845, while under the same Act they procured powers to construct a loop from Portobello East junction to the present Niddrie South junction where it joined the main line of the Edinburgh and Dalkeith Railway.

A HUNGARIAN LOCOMOTIVE OF NOTABLE DESIGN.



A RECENT 4-4-2 FOUR-CYLINDER COMPOUND LOCOMOTIVE.

Fitted with Brotan water-tube firebox.

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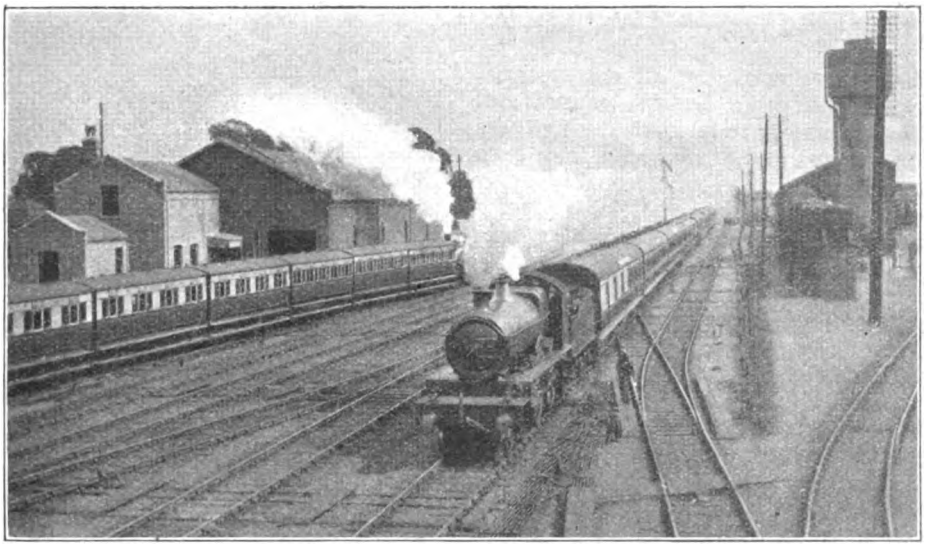

Photo.] [*H. Gordon Tidey.*

SOUTHALL–VICTORIA TRAIN (ON LEFT) LEAVING SOUTHALL, GREAT WESTERN RAILWAY.

London Train Services which have Disappeared.

By G. A. SEKON,

AN ardent railwayist absent from London since the early years of the present century, and unable to refer to the RAILWAY MAGAZINE month by month, upon returning to the Metropolis in the year of grace 1923 would find transportation facilities in the world's centre much altered.

On the whole he would find the means of transport increased very materially, and the time consumed in travelling between any two points much decreased. But if he sought to travel by steam train routes that had been established ever since he was old enough to take an intelligent interest in the facilities of locomotion, he would find that several of these old-established services were no longer in operation. He would, indeed, find it difficult to pass from one part of the metropolis to another without inquiry of those cognisant of present-day travel arrangements.

Withdrawal of many of the urban steam train services can be traced chiefly to two causes: (*a*) the complete substitution of motor buses and electric trams for the slow-moving horse-hauled vehicles of both types, (*b*) the number of new "tube" railways now in operation. As a result, more frequent and in most cases more expeditious means of travelling between various points are now available, and there is less demand for railway services on routes where the volume of passenger travel was never very great, and whose principal value was for interconnection purposes.

Another factor causing the withdrawal of such services was the reduction in the volume of traffic. In many cases this arose from the effective competition of the motor buses and electric trams, but in some districts it resulted from the entire change in character of the neighbourhood, and the migration of so many of the better class of travellers to residential districts further out.

Certain of these train services were withdrawn or modified prior to the war, and several stations had been closed. The

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necessity for restricting all non-essential services, and other factors, caused still further reductions to be made during those fateful years, and many have not been restored, while some will probably never be resumed.

Many of the train services which have now disappeared possessed considerable interest, and a selection of them may therefore be considered briefly.

One of the first of these once familiar London train services to be withdrawn was that of the joint Metropolitan and Great Western Railways between Aldgate and Richmond, *via* Hammersmith (Grove Road) and the London and South Western Railway. This was withdrawn from January 1, 1907, mainly in consequence of electrification of the Hammersmith and City line. This service had been operated for many years, having been inaugurated between Richmond and Bishops Road in June, 1870. It was then worked by the Great Western Railway, but on October, 1871, was withdrawn. On June 1, 1877, the Metropolitan District Railway commenced to run through trains to Richmond, and on October 1, 1877, the Metropolitan Railway introduced a competitive service between Moorgate Street and Richmond, the trains of both companies using London and South Western Railway lines between Ravenscourt Park and Richmond. The service was an hourly one. The Metropolitan-Richmond trains ran in the time of one of the 10 min. Moorgate-Hammersmith trains, but using the Grove Road (L. & S.W.R.) station at Hammersmith. A long footbridge connected the two stations at Hammersmith, so that passengers could transfer from one to the other when necessary. From January 1, 1894, the Great Western Railway, as one of the partners in the Hammersmith and City Joint Railway, took over the working of the Aldgate–Richmond service.

When the Hammersmith and City line was electrified to Hammersmith in September, 1905, the Richmond service necessarily had to be conducted by steam trains, as the L. & S.W.R. connecting portion of the route was not electrified. A service of G.W.R. steam trains, at half-hourly intervals, was substituted for the Aldgate-Richmond service, running between Richmond and Notting-Hill. For the convenience of shunting these trains a siding was put in between Notting Hill and Westbourne Park stations. This service was not of long duration, being withdrawn on December 31, 1910, since when passengers have had to change to Metropolitan District trains at Hammersmith.

Extension of the City and South London Railway to Euston, on May 12, 1907, provided a "tube" railway between King's Cross and London Bridge. Recognising the inutility of the service run between the S.E. & C.R. (S.E. section) and the G.N.R., this service was withdrawn on April 30, 1907. These trains were never very frequent, or widely used; the service was inaugurated solely as part of the excessive competition between the S.E. and L.C. & D. Railways. A connecting spur was constructed between the two systems at Blackfriars in 1878. The through trains were provided by the S.E.R. and ran between Greenwich, Woolwich, etc., on that railway, and Muswell Hill, Enfield and Finsbury Park on the G.N.R. New close-coupled rolling-stock was provided for the trains. We believe they were the first close-coupled trains possessed by the S.E.R. Condensing engines were necessary for working over the Metropolitan Railway between Farringdon Street and King's Cross. At first the S.E.R. hired suitable locomotives, of the 4-4-0 type with outside cylinders, made by Beyer, Peacock & Co., and exactly similar to those of the Metropolitan Railway. Later the S.E.R. had some condensing tank engines built for this service, and that over the E.L.R. to Liverpool Street. Gauge restrictions necessitated a short chimney. The feud between the S.E. and L.C. & D.Rys. prevented passengers to and from the L.C. & D.R. making use of these trains at Ludgate Hill or Snow Hill, so that the through passengers were merely those to and from the G.N. and S.E. Railways, or, if such there were, between the Metropolitan and S.E. Railways. The service was inaugurated on June 1, 1878, ran on weekdays only, and consisted of nine trains in each direction. A feature of the service was its long-spread-out character; the first train arrived at King's Cross from the S.E.R. at 5.58 a.m., and the last left there for the S.E.R. at 10.54 p.m.

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The withdrawal of the S.E.-G.N.R. through service presaged the extinction of the one-time competitive service, and five months later saw the withdrawal of an even older service of London's steam trains, viz., that between Victoria (L.C. & D.) and the G.N.R. This service had long outlived its utility. At the best it was more useful for passengers between the L.B. & S.C.R. at Victoria and the G.N.R., as those travelling between the G.N.R. and L.C. & D.R. would obviously only make use of the service between Ludgate Hill or Holborn (Snow Hill Low Level) and the G.N.R. The initiation of this service can only be ascribed to the remarkably hypnotic influence of the late J. Staats Forbes, who appeared able to induce otherwise shrewd railway officers to support, by financial aid, his schemes for the extension of the L.C. & D.R. The G.N.R. subscribed £330,000 at 3½ per cent. to the L.C. & D. Railway's extensions in the London district, in exchange for certain running powers, etc. The service commenced on January 3, 1866, and was between King's Cross and Ludgate Hill, being worked by the G.N.R. From August 1, 1866, it was continued southward to Herne Hill, and northward to Hatfield, 14 or 15 trains being run each way daily, on week days stopping at all stations *en route*, the trains being provided by both Companies. The service was afterwards diverted at Loughborough Junction to Victoria, while instead of running through to Hatfield on the G.N.R., New Barnet, Enfield and Finsbury Park became the northern termini.

When the service ceased there were about 13 trains each way on weekdays, with no Sunday service. The time allowed was about 45 min. for the railway journey of nine miles between Victoria and King's Cross, G.N.R. Despite this liberal timing the trains were usually much delayed; almost every station is a junction and goods trains to the G.N. and Midland and the S.E. & C.R. were freely interspersed, so that punctuality could scarcely be expected. Further, the service was provided for the convenience of through passengers between the two railways, and if the through trains failed to make the assumed connections with the main line trains they were worse than useless for the purpose. Electrification of the Inner Circle, providing a quick and frequent service between King's Cross (for the G.N.R.) and Victoria and Blackfriars (for the Chatham section of the S.E. & C.R.), with the opening in December, 1906 of the Great Northern, Piccadilly and Brompton Railway, removed any lingering ideas as to the need of this G.N.-Victoria service.

Another old steam train service in London to which electrification and motor-buses gave the *congé* was the "Middle Circle," provided by the G.W.R. The forerunner of the "Middle Circle" was a service of G.W.R. broad-gauge trains between Farringdon Street and Addison Road, which commenced to run April 1, 1865. On December 23, 1865, Moorgate Street became the City terminus. On completion of the Metropolitan District Railway to Mansion House, and the construction of the connecting spur between the West London Extension Railway and the Metropolitan District Railway west of Earl's Court, a route was opened for the trains right through from Moorgate Street to Mansion House. These were called "Middle Circle," those *via* High Street, Kensington, "Inner Circle" and the L. & N.W. Railway service between Broad Street and Mansion House, "Outer Circle." The G.W.R. complete "Middle Circle" train service dates from August 1, 1872.* These trains were, of course, narrow-gauge. The coaches must have been amongst the earliest narrow-gauge ones possessed by the G.W.R., and were extremely cramped, perhaps as an object lesson to travellers to emphasise the "spaciousness" of the broad-gauge vehicles. They had large wheels, the boxing of which projected above the floors. In some of the coaches, these projections were partly against the doors, and had to be stepped over by passengers when entering and alighting. These small coaches continued to be used on the "Middle Circle" service for about 20 years, being then replaced by four-wheelers of the class still, to some extent, in use on the G.W.R. The G.W.R. engines working the trains were small 2-4-0 tanks, with no cab.

From July 1, 1900, the "Middle Circle"

* The Metropolitan Railway's records shows a service between Moorgate Street and Mansion House from July, 1871, via "West Brompton," but the route is not clear.

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trains ceased to run over the Metropolitan District between Earl's Court and Mansion House, consequent upon the approaching opening of the Central London Railway. The "Middle Circle" trains carried passengers from Uxbridge Road and Addison Road to Mansion House, and the opening of the "twopenny tube" would naturally abstract this traffic, the fares, time on journey and frequency of service causing the "Middle Circle" trains to be "out of the running." For about the first twenty years of service, the "Middle Circle" trains ran half-hourly, but afterwards were at 20, 10, 20 and 10 min. intervals per hour—four trains. Electrification of the Metropolitan District Railway caused a further curtailment in the route of the "Middle Circle" trains; from February, 1, 1905, they terminated at Addison Road. October 30, 1910, saw the last of the shortened service, the trains to Aldgate being withdrawn. An electric service betwen Edgware Road and Addison Road is now run and forms the connection between the Metropolitan and West London and West London Extension Railways.

War-time cancellations affected both the Midland and G.N. Railways services over the Metropolitan Railway's widened lines between King's Cross and Moorgate Street. The area between these points is now so well served by electric trains (Inner Circle and City & South London), electric trams, and (by changing at the Angel) by motor 'buses, that the running of steam trains by the G.N. and Midland Railways, save for the morning and evening business traffic, was a waste of train mileage. Advantage was therefore taken of war-time economy to withdraw the services from about 10 a.m. to 4 p.m. and after 8 p.m. on weekdays, (Saturdays after about 4 p.m.) and all day on Sundays. The return of peace has not induced the railways to restore these unremunerative steam train services. The Midland service to and from Moorgate Street dates from August 13, 1868, and the G.N.R. service from June 1, 1869.

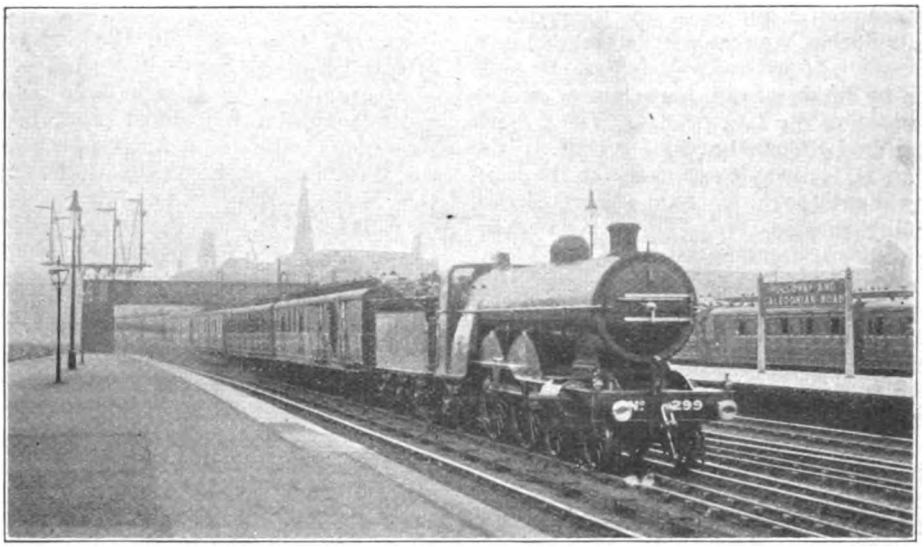

Photo.] [*H. Gordon Tidey.*

GREAT NORTHERN RAILWAY EXPRESS PASSING HOLLOWAY STATION (NOW DISMANTLED.)

Midland trains were originally worked by Metropolitan type 4-4-0 tank engines with outside cylinders, but the G.N.R built for its service 0-4-2 condensing tank engines, some with radial axles for the trailing wheels. Until about 15 years ago both railways employed close-coupled four-wheel coaches, the Midland trains being in two sections, one section only being employed during the slack hours. The original trains of both companies were

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lighted by gas, carried in containers on top of the coaches, the G.N.R. containers consisting of two circular pipes about 15 in. diameter, extending the length of the coach.

Although not the next in chronological order, but concerned topographically, is the very frequent service of L.C. & D.R. trains run to Moorgate Street, *via* Snow Hill and Aldersgate Street, inaugurated September 1, 1871, withdrawn as a war-time economy and not reinstated. Mr. J. S. Forbes for once appears to have been "caught napping" in agreeing to provide so liberal a train service to and from Moorgate Street. Secret railway history may of course show that the L.C. & D.R. received a "*quid pro quo*" for this waste of train mileage, which continued for 50 years. Holborn could often be reached as quickly on foot from Moorgate Street as by train. The trains were subject to delays caused by other trains at five junctions between Snow Hill and Moorgate Street; (*a*) trains from Farringdon Street at Snow Hill, (*b*) G.W. goods trains at Smithfield, (*c*) G.N. and Midland trains at Aldersgate Street, (*d*) Midland goods trains at Whitecross Street and (*e*) G.N. and Midland trains at Moorgate Street.

Here also may be mentioned the service of through trains between the Midland and L.C. & D. Railways, inaugurated June 1, 1869, to give the M.R. facilities equal to those enjoyed by the G.N.R. in connection with the L.C. & D.R. The service was withdrawn July 1, 1908. When Midland main line expresses ceased to call at Kentish Town, any little use the service might have been for through passengers passed, there being no method of joining the through trains at St. Pancras, such as existed at King's Cross in the case of the G.N.R., *i.e.*. to L.C. & D.R. by joining the through trains at York Road, and from the L.C. & D.R., by alighting at King's Cross Suburban. The through service was of little use for local passengers. For instance, Finchley Road to Victoria by train is 13 miles, against about 4 miles by motor 'bus, the train journey occupying about 60 minutes, that by the bus about half that time. There were 12 or 13 through trains in all provided by the two railways. On the Midland R. the S.E. & C.R. trains started and terminated at Kentish Town, Finchley Road and Hendon. Most of those provided by the M.R. had Kentish Town as their place of origin or destination, others made a similar use of Hendon and South Tottenham.

Two London and South Western Railway long-drawn-out services were brought to a decent conclusion by war economy. They, like those run by the G.N.R. over the L.C. and D.R., were provided because the company had been induced to invest money in the construction of lines in the Metropolis by and for the use of, the L.C. and D.R. The sum invested by the L. and S.W.R. in the L.C. and D.R. was £310,000. The services comprised those via Brixton, and others via Tulse Hill and Herne Hill. All these L. and S.W.R. trains made use at different times of Ludgate Hill, Holborn Viaduct and Snow Hill (Holborn Low Level) as their City terminus. At the end they ran to and from Ludgate Hill, but worked empty to and from Snow Hill sidings, where the engines ran around their trains.

The first L. and S.W.R. service to Ludgate Hill was from Kingston via Clapham Junction, Lavender Hill, Longhedge and Factory Junctions, Brixton and Loughborough Junction, and commenced on April 3, 1866. The opening on January 1, 1869, of the L. and S.W.R. strategic line from Richmond to Addison Road via Hammersmith provided a circuitous route (by means of Latchmere, Longhedge and Factory Junctions at Battersea), 14¾ miles in length, between Richmond and Ludgate Hill, and a service of L. and S.W. Railway trains, about 10 each way on weekdays only, was run for many years. The journey occupied from 58 to 62 minutes. By July, 1914, this service had been reduced to one train each way, with an extra one down on Saturdays. Two other trains ran as far as Loughborough Junction. Electrification of the L. and S.W. Railway, as well as the Metropolitan District and North London lines to Richmond, together with the competition of motor buses and electric trams, denuded this service of through and local traffic. So much so, that when war time curtailments in services were imperative, not only was this service withdrawn, but the L. and S.W.R. closed its line between Richmond and Addison Road,* while the

* Both the Central London and London Electric Railways have proposed to make use of it between Shepherd's Bush and Ravenscourt Park, and to electrify it.

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S.E. and C.R. closed the stations between Victoria and Ludgate Hill for its own local traffic between these points. These arrangements continue.

The completion on January 1, 1869, of the L.C. & D. spur between Herne Hill and Tulse Hill provided the other route to Ludgate Hill for L. & S.W.R. trains. A service was run from and to Wimbledon there being 12 trains each way on week-days and five on Sundays. In later years the Sunday trains made St. Paul's their City terminus. Most of the week-day trains ran *via* Merton Abbey, but on Sundays only one used this route to and from Wimbledon, the other running *via* Haydons Lane. The Sunday service was withdrawn soon after the outbreak of war, whilst the week-day services did not survive the drastic war curtailments.

Electrification of the L. & S.W.R. line between Wimbledon and Waterloo, connecting thence with the City by the Waterloo and City "tube," as well as the District electric services to and from Wimbledon, were potent factors in making superfluous this steam train service. About 31 to 40 min. were absorbed in the journey of 10½ miles.

The "outer circle" service of the L. & N.W.R., between Broad Street and Mansion House, was inaugurated on February 1, 1872, and continued till December 31, 1908, almost 37 years. The week-day service was half-hourly, 76 min. being occupied in traversing the 19½ miles. On Sundays the trains ran at hourly intervals. Originally, as for several other services working on the Underground the Metropolitan type of 4-4-0 tank engine with outside cylinders was employed. Later the L. & N.W.R. built condensing locomotives for hauling these trains. Originally the coaches were painted standard L. & N.W.R. colours, but in later years an all-teak livery was introduced for the "Outer Circle" trains. Electrification of the Metropolitan District Railway was responsible for the abandonment of this service. From January 1, 1909, the L. & N.W.R. provided a service between Willesden or Broad Street and Earls Court, *via* Addison Road. This is now an electric service.

The L. & N.W.R. provided two services between its own system and that of the L.B. & S.C.R. One, from Broad Street to Victoria, *via* Willesden Junction, Addison Road and the West London Extension Railway, was introduced January 1, 1869, with an hourly service. This service developed into the "Outer Circle" in 1872. It was succeeded by one between Willesden Junction and Victoria (L.B. & S.C.) with eight trains each way on week-days, the journey occupying 25 min. against 29 min. by the "Outer Circle" trains between Victoria (District) and Willesden Junction. Four trains in each direction were run as late as April 1917. The L. & N.W. through service to Croydon *via* Addison Road, Clapham Junction and Crystal Palace, was started May 1, 1875,* five trains each way were run occupying 51 to 58 min. This survived well into the war, one train each way running as late as April, 1917.

Instituted as long ago as April, 1863, as a result of the G.W.R. being joint lessee with the L.C. & D.R. of one half of Victoria station, Pimlico, a service of G.W.R. trains was run to and from Victoria. The trains left the G.W.R. main line at North Pole Junction, east of Acton, passed over the West London and West London Extension Railways to the L.C. & D.R. at Battersea. At first the trains were broad-gauge. The starting and terminating point of this service on the G.W.R. was mainly Southall, but some of the trains have run as far down the line as Reading and Windsor, whilst Uxbridge had been the terminus of certain trains. The service generally consisted of eight trains each way on week-days, there being none on Sundays. This was one of the first services to be withdrawn in the early months of the war. That the service should have persisted for so many years is remarkable. Upon the opening of the "Inner Circle" line from Praed Street to Victoria, at the end of 1868, the need for such a service ceased, as the Inner Circle provided a much better, quicker, and much more frequent connection between the termini of the two systems. The change of trains at Southall was of no use for G.W.R. long-distance trains. Obviously the circumstance that the G.W.R. was financially interested in Victoria station had its effect on the continuance of the

* Superseding a service between Euston and the Crystal Palace, dating from 1863.

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through service. In the summer just prior to the war the G.W.R. was cultivating a Sunday traffic from Victoria to Thames-side resorts, and, by means of rail motors, from Clapham Junction, pleasure traffic to the new lines in the Ealing–Uxbridge district. These Sunday services did not reappear after 1914.

The G.E.R., as one of the joint lessees of the East London Railway, made commendable efforts to develop traffic to and from the L.B. & S.C.R., *via* the Thames Tunnel. Two services were provided; one to Croydon and the other to New Cross, L.B. & S.C., under the terms of the lease which took effect October 1, 1884. Seven trains each way were run on weekdays between Liverpool Street and Croydon (originally to the Central station, but upon that station being closed, to New Croydon). The journey occupied from 45 to 51 min. This service ceased on June 30, 1911, as the lessees had decided to electrify the East London Railway. The Liverpool Street–New Cross service consisted of about 12 trains daily each way, in addition to those to and from Croydon.

A service between Peckham Rye and Shoreditch was run by the L.B. & S.C.R. concurrently with the G.E.R. services. About 19 trains ran each way on weekdays and 11 on Sundays at irregular intervals, and occupied 20 min. The L.B. & S.C.R. also ran a service between its New Cross station and Shoreditch. Apart from electrification of the E.L.R., the electrification of the South London line of the L.B. & S.C.R., motor buses between the City and Peckham Rye, and electric trams in the South London district, killed effectually these L.B. & S.C.R. steam services to and from Shoreditch.

Amongst sections of line closed during the war which still remain so because of electric trams and motor 'bus services, may be mentioned the Nunhead-Greenwich section of the S.E. & C.R., the connecting lines between Beckenham Junction and Norwood Junction, and Beckenham Junction and Crystal Palace (Low Level). The Sunday closings are many. The whole of the S.E. & C. line east of Loughborough Junction *i.e.*, Crystal Palace, Nunhead and Shortlands *via* Catford, comes under this category, except that the afternoon boat train from Dover, and the evening boat train from Folkestone are each given one conditional timing from Shortlands to Victoria *via* Catford; whilst the 10.10 a.m. Victoria to Ramsgate runs over this route. These trains do not call at stations in the section.

EARTHQUAKES AND RAILWAYS.

In countries subject to earthquakes railways have difficulties unknown on British lines. The view reproduced shows a sleeping-car train on the Longitudinal Railways of Chile overturned by an earthquake on the Coquimbo-Serena section.

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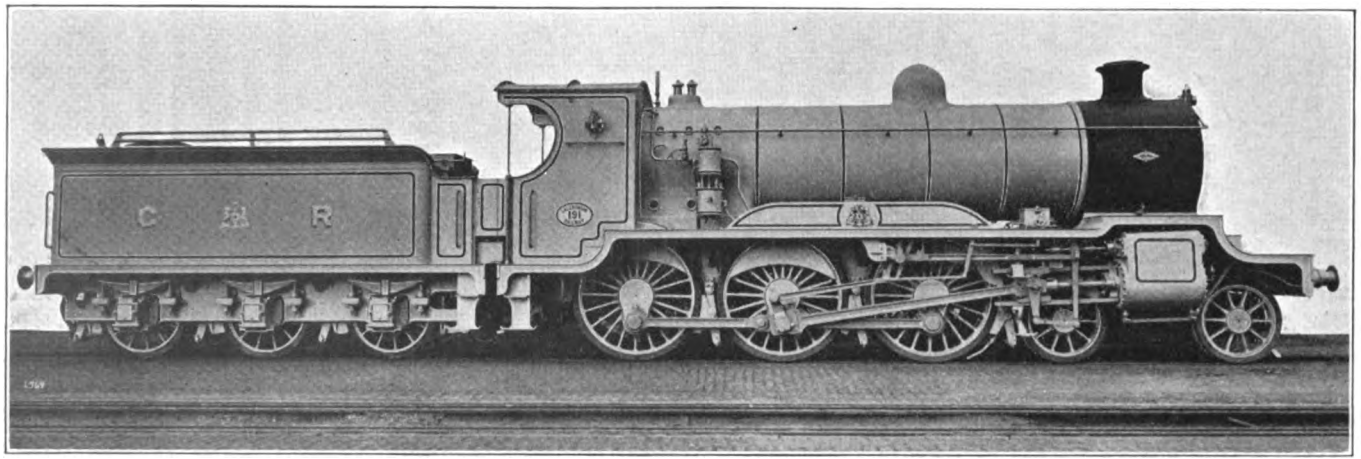
NEW 4-6-0 LOCOMOTIVE FOR THE OBAN LINE, CALEDONIAN SECTION, NORTHERN DIVISION, LONDON MIDLAND & SCOTTISH RAILWAY.

MR. W. PICKERSGILL, C.B.E., Mechanical Engineer, St. Rollox, Glasgow.



By courtesy of Mr. W. Pickersgill, C.B.E., Mechanical Engineer, St. Rollox, Glasgow, London Midland & Scottish Railway, we are enabled to illustrate and describe a new 4-6-0 design recently introduced for service on the Oban Line. In general it may be described as a two-cylinder adaptation of Mr. Pickersgill's "956" class of main line 4-6-0 locomotives to meet the conditions of the very difficult Oban line, but with 5 ft. 6 in. coupled wheels as compared with the 6 ft. wheels of the "956" class, and the 5 ft. wheels of the McIntosh Oban engines.

Cylinders	19½ in. by 26 in.
Coupled wheels	5 ft. 6 in. diam.
Steam pressure	185 lb per sq. in.
Weight of engine (working order) ...	62 tons 15 cwt. 2 qr.
Weight of engine and tender in working order,	100 tons 12 cwt.

Heating surface, tubes	1,707 sq. ft.
,, ,, firebox	116 ,,
,, ,, total	1,823 ,,
Grate area	21·9 sq. ft.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

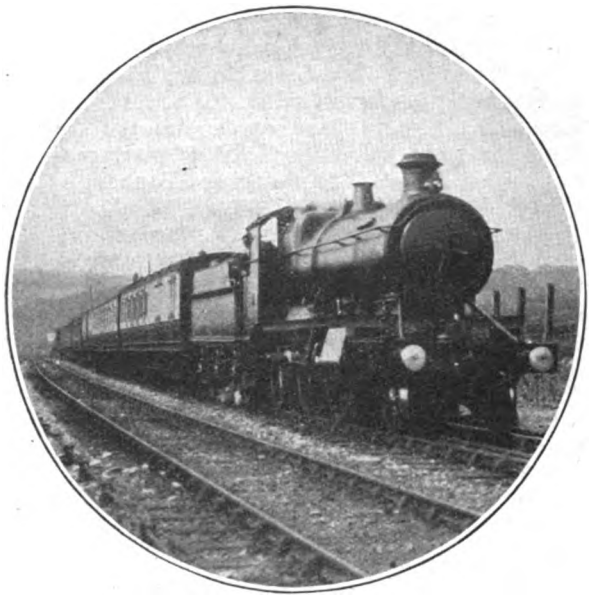

Photo.] [*E. A. Gurney-Smith.*

GREAT WESTERN RAILWAY.

12.0 noon Penzance–Liverpool express passing Long Rock. 2-6-0 locomotive No. 5341.

FIRST of all, in the present article, I want to give prominence to the wonderful running made by Driver Codd and Fireman Cameron, on the 10.51 a.m. Great Northern express from Doncaster to King's Cross, when, as mentioned last month, they succeeded in working an enormous train to town with a total loss of only half-a-minute on schedule—and this with an "Atlantic," on one of the workings designed for a "Pacific." No. 1452 was the engine—the pioneer of the first superheated batch of 1910—while the load was made up at Doncaster to ten 8-wheeled corridors and three 12-wheeled "diners," weighing 422 tons empty and 450 tons full. This was further increased at Grantham by the addition of the Lincoln coach (a 12-wheeler) to 64 axles, 458 tons empty weight and over rather than under 490 tons full, the train carrying, as usual, a very heavy complement of passengers and luggage. The most extraordinary feature of the running was the way in which an engine whose adhesion weight only reached the modest total of 36 tons and with cylinders no larger than 20 in. diameter by 24 in. stroke, was so driven as to accelerate from rest with a rapidity indistinguishable from that of a heavy six-coupled locomotive, and, further, to maintain practically as high uphill speeds as an engine of the latter type, on the long climbs with which the Great Northern main line abounds. This indicates driving and firing of the most expert order, as need hardly be said; at the same time the constant sharpness of the exhaust indicated that the engine was being worked exceedingly hard over every stage of the journey.

In the table on the next page all the passing times *en route* and the principal maximum and minimum speeds are set out in detail, for comparison with those tabulated in the February article, so that little further is needed in the way of description. The first surprise was that we should practically keep time on the stiff booking of 21 min. for 17·4 miles from Doncaster to Retford, the minimum rate of 48 m.p.h. up 2 miles at 1 in 198 up to Piper's Wood (from a maximum of 53½ at Black Carr), and the well-sustained speed from there to shutting off steam for Retford, being both excellent from a "cold" start. Then followed a magnificent exit from Retford to Markham Box—first a level mile, then entirely 1 in 178–200 up, on

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which ascent we attained exactly 40 m.p.h.—with a high subsequent speed across the Trent Valley, 5 min. 25 sec. being a very fast time from Carlton to Newark. The slight rise on to Claypole did not bring the speed below the "sixty" mark, but on the 1 in 200 to Peascliffe Tunnel we got down finally to 42½ m.p.h. Only 10 sec. were dropped from Retford to Grantham, making now 20 sec. loss from Doncaster. But these were more than regained by 30 sec. improvement on schedule between Grantham and Peterborough, the 29·1 miles being run in 33½ min.

On the 1 in 200 from Grantham up to Stoke, which begins right off the platform end, we got up to nearly 40 m.p.h.; then we ran the 15·2 miles from Corby down to Helpston at an average of 73 m.p.h. From Peterborough again, we started extraordinarily well, seeing that the line rises at 1 in 227 off the platform end up to the Great Eastern Railway bridge; the maintained speed of 44 m.p.h. up the 1 in 200 of Ripton bank, and the time of 27 min. 40 sec.—with nearly 500 tons behind the tender—over the 27 miles from Huntingdon to Hitchin, were both remarkable feats for an engine of this type. A fine concluding effort was made, too, from Hatfield up to Potter's Bar, so that the time from Hatfield into the terminus was only 19 min. 5 sec. Thus we came right up from Peterborough, with this colossal train, in 84 min. 40 sec.—that is to say, in forty seconds only over the exacting allowance of 84 min. Before the war 86 min. were allowed for a train-load of round about one-half this figure. Deducting from this 40 sec. the 10 sec. which the engine had previously gained, we got a net loss of ½-min. on the whole journey. Needless to say, while watching the "Atlantic" backing down at Doncaster, in place of the anticipated "Pacific," I never dreamed that such a feat of timekeeping was possible in the circumstances, with the engine set to haul some 7½ times her own weight on such sharp timings, and it was a pleasure on arrival at King's Cross warmly to congratulate Driver Codd and Fireman Cameron on their achievement.

In view of what was said last month (which is in no way contradicted by the phenomenal effort just recorded) as to the excessive difficulty of working this train throughout with "Atlantics" when one of the "Pacifics" is laid up, readers will be interested to hear that the Great Northern authorities now break through their rigid anti-piloting rule to the extent

L. & N. E. (GREAT NORTHERN) RAILWAY.

4-4-2 Superheater Engine No. 1452. Driver Codd, Fireman Cameron. Load, ex-Doncaster:—58 axles: 422 tons tare; 450 tons full. Load ex-Grantham: 64 axles: 458 tons tare; 490 tons full.

Distance.		Time.		Speeds.*
Miles.		m.	s.	m.p.h.
0·0	Doncaster	0	00	—
4·7	Rossington	7	50	53½
6·6	Piper's Wood Box ..	10	05	48
8·3	Bawtry	12	00	69
12·1	Ranskill	15	25	—
14·3	Sutton	17	35	—
17·4	Retford	21	10	—
4·9	Markham Box ..	9	00	40½
6·7	Tuxford	11	05	—
12·2	Carlton	15	50	75
18·5	Newark	21	15	—
23·2	Claypole	25	45	60
27·1	Hougham	29	55	52
28·9	Barkston	32	10	42½
33·1	Grantham	38	10	49½
5·4	Stoke Box	10	30	38
8·4	Corby	14	00	—
13·3	Little Bytham ..	18	10	77½
16·9	Essendine	20	55	77½
20·7	Tallington	24	00	—
23·6	Helpston	26	30	71½
26·0	Werrington Jc. ..	28	40	66
29·1	Peterborough ...	32	30	—
3·8	Yaxley	6	55	—
7·0	Holme	10	10	61½
12·9	Abbot's Ripton ..	16	40	44
14·4	Ley's Box	18	35	—
17·5	Huntingdon	21	45	70½
20·4	Offord	24	20	—
24·7	St. Neot's	28	25	56½
28·9	Tempsford	32	40	64½
32·3	Sandy	36	00	—
35·3	Biggleswade ..	39	10	—
39·4	Arlesey	43	45	—
40·7	Three Counties ..	45	10	—
44·5	Hitchin	49	25	—
47·8	Stevenage	54	00	45
51·4	Knebworth	58	10	—
54·4	Welwyn	61	40	—
58·7	Hatfield	65	35	70½
63·7	Potter's Bar ..	70	50	54
67·2	New Barnet	74	25	—
71·4	Wood Green ..	78	05	70½
73·9	Finsbury Park ..	80	35	—
76·4	King's Cross ..	84	40	—

* Maxima and minima by chronograph.

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of allowing "Atlantics" a 4-4-0 pilot from Peterborough up to King's Cross. The result has been greatly improved punctuality of arrival, especially on Wednesdays.

In fulfilment of the promise given in the January issue, I now wish to pass on to some runs over the Glasgow and South Western section of the London Midland and Scottish Railway, of which I saw a great deal during the course of last year. These runs appear in two tables—first seven south-bound trips on the London day trains (with the exception of No. 3, which was on the 5.30 p.m. Leeds express

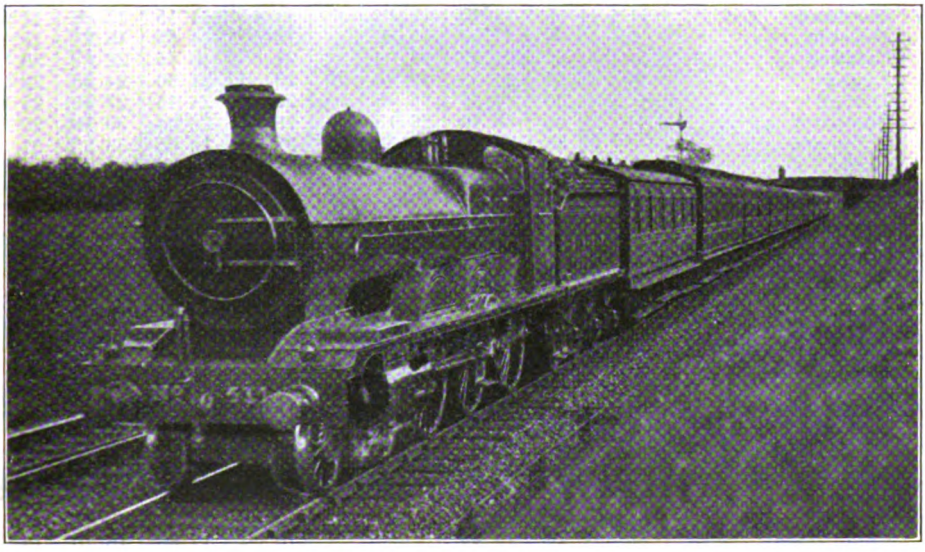

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*H. Gordon Tidey.*

London–Glasgow express.
Glasgow and South Western Railway 4-6-0 locomotive, No. 511, as rebuilt by Mr. Whitelegg.

out of Glasgow), and then five journeys in the other direction. I am inclined to think the south-bound journey is rather the easier of the two, especially as between Kilmarnock and Dumfries. The worst of the climbing is on this section concentrated in 4¼ miles averaging 1 in 100, between Hurlford and Mossgiel Tunnel, near Mauchline, the only severe subsequent grades being 2¼ miles at 1 in 150 from Ballochmyle Viaduct up to Auchinleck, and 2 miles at 1 in 145-150 up from Old Cumnock, before the summit is reached near New Cumnock, 19 miles from the start. Some 4½ miles out of the latter distance are level or at easier than level grades.

But from Dumfries northwards the rise is practically unbroken for 13 miles from near Holywood to the Carronbridge Tunnel, and the welcome breathing space along the side of the deep gorge of the Nith, past Ardoch, with its magnificent scenery, is succeeded by 4 miles up at 1 in 180-215 to Sanquhar, and 3½ more at 1 in 200 from Kirkconnel. Then, when the summit is passed, speed has to be severely checked in this direction over colliery workings round Auchinleck, and is generally well restrained down the steeper part of the incline from Mauchline onwards, whereas the southbound expresses can and do maintain a mile-a-minute average practically throughout the 37 miles from New Cumnock to Dumfries. One is rather at a loss to understand why, in these circumstances, the schedule should be the same in both directions—71 min. for the 58·1 miles between Kilmarnock and Dumfries—especially as the 3 min. allowed in the timing for speed restrictions in the neighbourhood of Auchinleck barely affects south-bound trains at all, owing to the up-grade at this point. With the 3 min. deducted, the net booking of

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68 min. is really difficult, even with the light loads usually carried, but the general indications from the times noted are that it would rarely be observed, even if the over the mountainous grades of the Barrhead Joint Line (which include 3½ miles up continuously at 1 in 67-70 and 1¼ at 1 in 100 past Barrhead and Neil-

L.M. & S. (GLASGOW & SOUTH WESTERN) RAILWAY.—GLASGOW-CARLISLE.

Distance.	Run No. / Engines ex-Glasgow / Engines ex-Kilmarnock / Load (axles) : / Load (tons tare) : / Load (tons full) :	Schedule.	1 511 511 29 183 190	2 498 498 33 210 220	3 510 510 34 212 225	Schedule.	4 505 502 34 218 230	5 504 & 256 502 42 248 260	6 501 & 427 506 & 427* 51 316 340	7 545 & 348 506 & 348 61 357 380
Miles.		Min.	M. S.	M. S.	M. S.	Min.	M. S.	M. S.	M. S.	M. S.
0·0	St. Enoch	0	0 00	0 00	0 00	0	0 00	0 00	0 00	0 00
1·9	Strathbungo	4	4 25	4 25	4 35	4	4 15	4 05	4 25	4 20
5·9	Nitshill	—	9 30	10 15	10 00	—	9 35	9 10	10 00	9 35
7·6	Barrhead	11	11 35	12 40	12 10	11	11 45	11 15	12 00	11 35
9·7	Neilston	—	15 30	17 00	15 50	—	15 50	14 55	16 25	15 20
12·7	Caldwell	—	21 00	22 35	21 00	—	21 35	19 45	22 55	20 50
14·3	Lugton	23	22 55	24 35	22 55	23	23 30	21 30	24 55	22 35
16·7	Dunlop	—	25 30	27 35	25 45	—	26 05	24 15	27 40	25 35
18·9	Stewarton	—	28 00	30 10	28 15	—	28 30	26 35	30 10	28 05
22·1	Kilmaurs	—	30 55	33 05	31 30 sigs.	—	31 35	30 05	33 25	31 35
24·3	Kilmarnock	34	33 50	36 00	36 25	34	34 20	33 30	36 30	34 55
1·8	Hurlford	—	3 50	4 00	3 50	—	4 00	4 10	3 45	3 50
9·4	Mauchline	15	16 30	16 50	16 50	15	17 05	18 20	17 30	17 45
13·8	Auchinleck	—	22 05	23 05	22 55	—	22 50	24 05	23 30	23 40
15·8	Old Cumnock ..	—	24 55	26 00	25 50	—	25 30	26 40	26 00	26 15
21·2	New Cumnock ..	32	32 10	34 00	33 05	32	32 25	33 40	32 50	33 10
28·6	Kirkconnel	—	40 20	42 30	40 40	—	40 00	41 10	40 50	40 55
32·0	Sanquhar	—	43 30	45 55	43 55	—	43 20	44 20	44 05	44 05
40·6	Carronbridge ..	—	51 55	55 15	53 05	—	52 05	53 05	53 05	52 35
43·9	Thornhill	56	55 20	58 40	56 25	56	55 30	56 35	56 30	55 50
46·6	Closeburn	—	58 10	61 10	58 50	—	58 05	59 00	59 10	58 15
50·6	Auldgirth	—	62 10	64 50	62 40	—	61 50	62 45	62 55	61 50
54 7	Holywood	—	66 10	68 20	66 40	—	66 05	66 40	66 50	65 50
58 1	Dumfries	71	†71 35	73 05	70 55	71	70 30	70 50	71 20	70 25
3·9	Racks	—	6 35	6 50	—	—	6 50	7 15	*7 00	6 40
8·5	Ruthwell	—	12·45	13·05	—	—	12 25	13 25	12 45	12 10
12·1	Cummertrees ..	—	16 20	16 45	—	—	16 00	17 00	16 10	15 35
15·5	Annan	19	19 45	20 05	—	21	20 05	20 40	20 05	19 15
18·5	Dornock	—	22·45	23 05	—	—	5 40	5 45	5 45	5 25
21·4	Rigg	—	25 50	26 05	—	—	9 10	9 25 sigs.	9 10	8 45 sigs.
24·3	Gretna	30	29 25	29 35	—	12	12 40	14 45	13 05	13 50
29·0	Rockcliffe	—	34 35 sigs.	34 55	—	—	17 35	20 40	18 05	19 30
33·1	Carlisle	42	40 50	40 25	—	23	23 10	26 20	23 50	25 55

Engines :—498, 501, 502, 504, 505, 506, 510 and 511 : Rebuilt 4-6-0 type. 545 : 4-6-4 tank. 256 and 348 : Manson rebuilt 4-4-0. 427 : Small Manson 4-4-0.
* Pilot off at Dumfries. † Signal check outside station.
Thick horizontal line indicates stop.

pitfall cautions were removed, unless present-day running were expedited.

By comparison, the timings over the slight undulations between Dumfries and Carlisle provide easy work, and the allowances between Kilmarnock and Glasgow, ston, coming south) are not unduly difficult.

We come now to the runs from Glasgow to Carlisle. The first two were on the mid-day express, with which the engine works through. No. 511, with a light

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load, did quite well, reaching 53 m.p.h. on the gradual rise to Nitshill, maintaining 25½ up Neilston bank, touching 53½ on the Lugton "plateau," slacking to 50 through Stewarton, and touching 72½ at Kilmaurs, prior to the usual very slow stop at Kilmarnock, in order to draw up to the water column. No. 498, on a day of strong south-west wind and drizzle, dropped 2 min., mostly in the early stages, as speed did not rise above 45½ m.p.h. at Nitshill; after that the minimum on the climb and the maximum at Kilmaurs were the same as on the previous run. No. 510, with a heavier engine is changed daily at Kilmarnock. No. 505, on No. 4 run, made a good start to Nitshill, reaching 50 m.p.h., but fell to 23½ m.p.h. on Neilston bank, which loss of time even a maximum of 74 m.p.h. at Kilmaurs failed quite to retrieve, although by a smarter finish than usual we were only 20 sec. "down" on arrival, with 7 tons under "maximum" load. No. 504 piloted by a Manson—rebuilt 4-4-0, on what was for a double-headed train a very light load, touched 53 m.p.h. at Nitshill, and only fell to 29½ m.p.h. on the Neilston climb, so gaining 1½ min. to Lugton by what was considerably

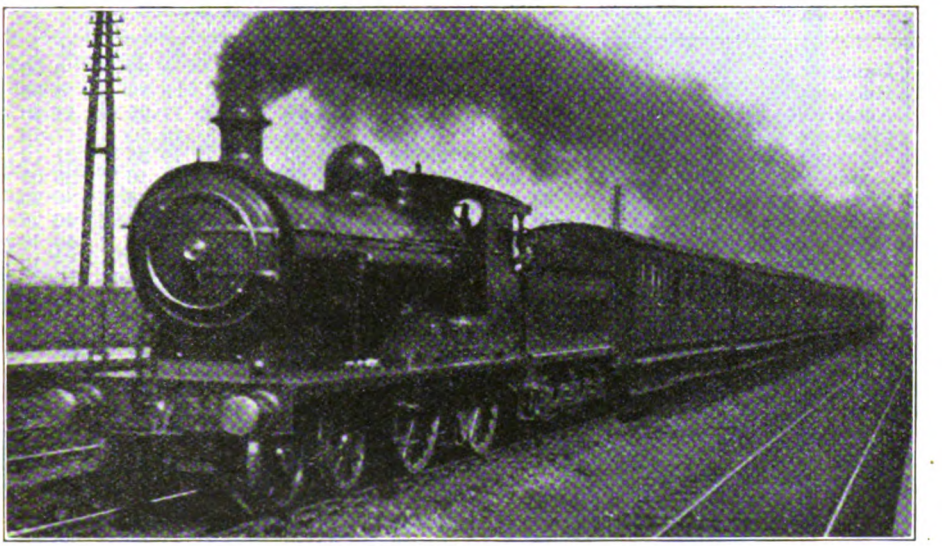

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Henry L. Salmon.*

Glasgow–Greenock express passing Cardonald.
Glasgow and South Western 4-4-0 locomotive, No. 351, as rebuilt by Mr. Whitelegg.

train, made a slower start to Strathbungo, but got up to 50½ m.p.h. at Nitshill, and then made the best unassisted uphill running of any, not falling below 28 m.p.h., so that the outward time at Caldwell tied with that of number 1; after that we did not exceed 69 at Kilmaurs, and got signals on outside Kilmarnock, net time being about 34½ min. Tare load on this trip was within 13 tons of the maximum of 225 tons allowed to an unpiloted 4–6–0 from Glasgow to Kilmarnock.

The rest of the south-bound runs were with the 9.25 a.m. train, on which the the best start of the series; but a very leisurely descent to Kilmarnock resulted in an ultimate gain of ½-min. only. No. 501 and a small un-rebuilt Manson 4-4-0 in number 6 run did very poorly, even allowing for the heavy weight of the train; after touching 50 m.p.h. at Nitshill, they fell to 20½ at Neilston, and with no greater rate than 68 at Kilmaurs, dropped 2½ min. to Kilmarnock. Last of all we have the 4-6-4 tank run in the seventh column, already described in the issue of last August, wherein the pilot was a rebuilt Manson 4-4-0 and the 61-axle load exactly doubled the 190

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tons of the first run; speed was 53½ m.p.h. at Nitshill and 25½ at Neilston, so that Lugton was passed in ½-min. under schedule time; but such excessive caution was displayed here and at Stewarton, and on Kilmaurs bank, where speed was restricted to 61½ m.p.h. maximum, that we dropped nearly a minute to Kilmarnock. The times of number 4 run from Lugton onwards would have brought us into Kilmarnock in 32¼ or 32½ min.

On the second stage the present eased-out timing of 71 min. was maintained on every occasion but one, No. 498, in the second column, adding two more minutes to the two already lost at Kilmarnock. A speed of 31 m.p.h. was maintained on the 1 in 99 after Hurlford, but the recovery after Mossgiel Tunnel and the work generally from there on to Sanquhar was very poor (on the falling grades from Kirkconnel to the latter place we were actually running at 55 m.p.h. only) with the result that a maximum of 69 m.p.h. beyond Thornhill did not suffice to recover the arrears. No. 511, on the other hand, was on time, or but little behind, all the way from Kilmarnock to Dumfries, on the first run; mounting the 1 in 99 at 30½ m.p.h., we touched 56½ beyond Mauchline, maintained 40 on the 1 in 150-180 to Auchinleck, and 41 up the 1 in 145 to Old Cumnock, after which we kept up a good speed on to Thornhill, with a maximum of 70½ m.p.h. at Ardoch, and a minimum of 49 at Carronbridge Tunnel. Easy running fol-

L. M. & S. (GLASGOW & SOUTH WESTERN) RAILWAY.—DUMFRIES–GLASGOW.

Distance.	Run No. 4-6-0 Engine No. Load (axles): Load (tons tare): Load (tons full):	Schedule.	1 513 27 174 185	2 505 31 183 195	3 502 32 217 330	Schedule.	4 496 34 221 235	5 511 34 226 240
Miles.		min	M. S.	M. S.	M. S.	Min.	M. S.	M. S.
0·0	Dumfries	0	0 00	0 00	0 00	0	0 00	0 00
3·4	Holywood	—	5 40	6 15	5 55	—	6 10	6 05
7·5	Auldgirth	—	10 30	11 35	11 15	—	11 05	11 40
11·5	Closeburn	—	15 20	16 45	16 20	—	15 50	17 10
14·2	Thornhill	17	18 45	20 35	20 00	17	19 25	21 10
17·5	Carronbridge	—	23 20	25 30	24 55	—	24 10	26 05
26·1	Sanquhar	—	33 00	36 05	35 10	—	34 05	36 20
29·5	Kirkconnel	—	36 55	40 10	39 10	—	37 55	40 25
36·9	New Cumnock	44	46 00	49 00	48 00	44	46 45	49 40
42·3	Old Cumnock	—	52 00	54 40	53 35	—	52 15	55 10
			p.w.c.	p.w.c.	p.w.c.		p.w.c.	p.w.c.
44·3	Auchinleck	—	54 30	57 05	55 55	—	54 35	57 30
			p.w.c.	p.w.c.	p.w.c.		p.w.c.	
48·7	Mauchline	59	59 55	62 15	60 35	59	59 20	61 50
					p.w.c.			
56·3	Hurlford	—	68 00	70 10	69 40	—	66 35	69 20
58·1	Kilmarnock	71	70 45	72 45	72 25	71	69 00	72 05
2·2	Kilmaurs	—	—	4 55	¶5 40	—	5 00	4 55
5·4	Stewarton	—	—	10 20	11 10	—	10 45	10 50
7·6	Dunlop	—	—	15 00	15 15	—	15 00	15 25
							p.w.c.	
10·0	Lugton	16	—	17 40	17 55	16	19 15	18 10
14·6	Neilston*	—	—	23 10	23 40	—	24 25	23 30
16·7	Barrhead	24	—	25 25	26 30	25	26 50	26 00
20·9	Pollokshaws	—	—	30 00	31 15	—	31 30	30 30
22·4	Strathbungo	31	—	32 00	pass.	33	33 30	pass.
		32	—	32 25	32 55	34	34 30	31 30
				sigs.				sigs.
24·3	St. Enoch	36	—	39 30	36 50	38	38 40	36 15

Thick horizontal line indicates stop.

* Service slack. ¶ No. 502 changed for $\frac{4\text{-}6\text{-}4}{T}$ No. 545 at Kilmarnock.

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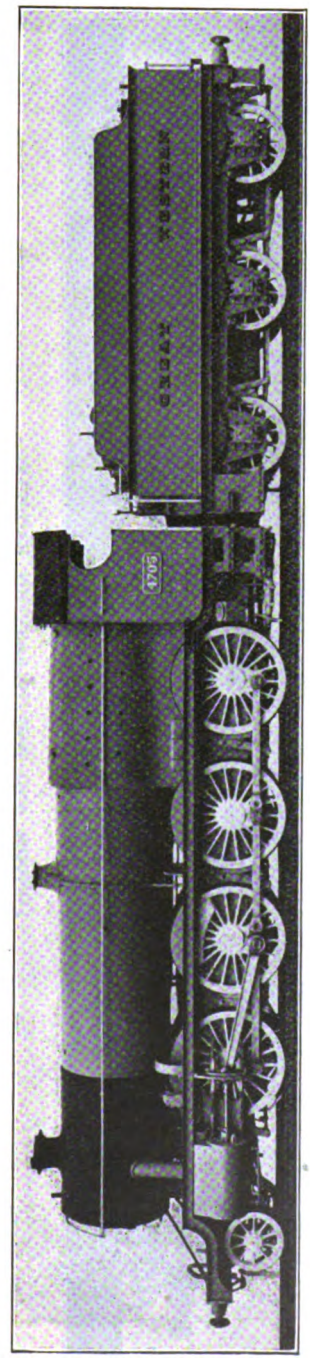
lowed, and apart from the signal check outside Dumfries, we should have stopped in 70½ min. On the 5.30 p.m., No. 510 did not do overwell on the ascending grades from the start, with a minimum on 29 m.p.h. on the 1 in 99 and of 39 at Auchinleck ; but from Old Cumnock the work improved, and from New Cumnock became good, except between Sanquhar and Carronbridge, where the top speed was only 64½ m.p.h. But we touched 70½ m.p.h. after Thornhill, and just kept time.

On number 4 run the engine from Kilmarnock was No. 502, which made a slow start with a minimum of 28 m.p.h. on the 1 in 99, but effected some really good running from Mauchline up to New Cumnock, the 11·8 miles being run in 15 min. 20 sec., with a minimum of 41½ m.p.h. at Auchinleck and one of 43 at Old Cumnock. On run number 5, the same engine, with a heavier tare load of 248 tons (within 7 tons of the maximum of 255 tons allowed unpiloted over this section), exactly equalled these times, again after a slow climb to Mossgiel, with a minimum of 25 m.p.h. Good speed was then made on both runs over the 33·5 miles from New Cumnock to Holywood, which occupied 33 min. 40 sec. and 33 min. exactly ; maxima were 64½ and 66 m.p.h. at Kirkconnel, 67 and 69 beyond Sanquhar, and 65 and 70½ m.p.h. after Thornhill, the time of arrival in each instance being just inside the 71 min. allowance. On the sixth run, 4-6-0 No. 506 carried the small 4-4-0 Manson pilot which had come with us from Glasgow, as far as Dumfries, and the work in these circumstances was as poor as on the previous length, such a speed as 24½ m.p.h. up the 1 in 99 from Hurlford, for example, being a feeble exhibition. Downhill speeds also were very restrained, and we lost 20 sec. on schedule to Dumfries. By comparison, the running of number 506 with the Manson 4-4-0 rebuild No. 348 on the 380-ton train, in column 7, was reasonably good ; ascending to Mossgiel Tunnel we dropped to 27 m.p.h., but by fast running from New Cumnock onwards time was kept.

A close study of these Cumnock-Dumfries times reveals the somewhat arbitrary way in which different drivers selected different sections for their respective speed exploits ; the aggregate of the best point-to-point times over the 36·9 miles is exactly 36 min., and this by no means immoderate and easily maintained downhill speed on all runs would have brought the seven trains into Dumfries in 68



2-8-0 MIXED-TRAFFIC LOCOMOTIVE, No. 4705, GREAT WESTERN RAILWAY.

Generally corresponding with No. 4700, previously illustrated and described, as fitted with a large boiler, No. 4705 has the latest arrangement of cylinders and steam pipes. The air valve, which on the first engine of the class was in prominent view on the cylinder, is now moved higher up to a position behind the steam pipe.

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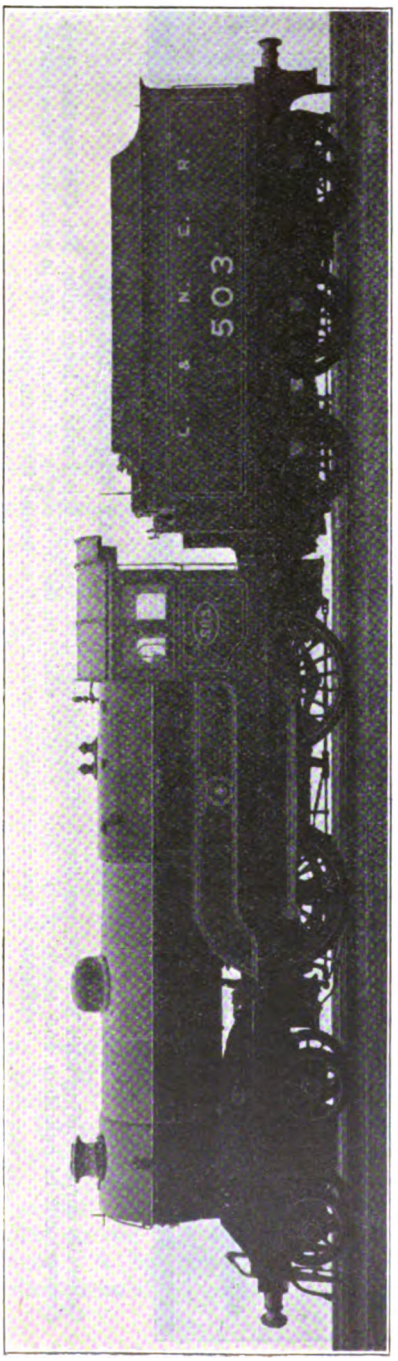
min. 10 sec., 70 min., 69 min. 5 sec., 68 min. 25 sec., 69 min. 40 sec., 68 min. 50 sec., and 69 min. 10 sec., respectively.—average almost precisely 69 min., as against the actual average of 71¼ min. It may also be noted that in no case was speed reduced in the neighbourhood of Auchinleck, so that the real net schedule of 68 min. was far from kept. But I am afraid that those three minutes are rather of the same nature—in this direction of running at least—as the mythical "6 min. allowed for permanent way cautions between Nottingham and Sheffield" on the Great Central, where I recently achieved quite a new record in the middle of the colliery area at Staveley, by a maximum speed of no less than 80 miles an hour!



LONDON AND NORTH EASTERN RAILWAY.

Great Central 4-4-0 locomotive No. 503, "Somme," as newly lettered and numbered. The elliptical number plate on the engine cab bears the number and the words "London and North Eastern Railway" and "Gorton Works," together with the date of construction. Engines of other sections will be similarly classified according to the locomotive headquarters, while retaining their present numbers. Passenger engines will be painted green and goods engines black.

Little need be said of the featureless running between Dumfries and Carlisle. The best running by far was that in the sixth column of No. 506, which appeared to travel much better without the pilot than with it. Attaining 50½ m.p.h. in 5 level miles out of Dumfries, we did not fall below 44 on 2½ miles at 1 in 150—this was quite brilliant with 340 tons behind the tender—and touched 69 before stopping at Annan in a start-to-stop time of 20 min. 5 sec. for the 15·5 miles. Time was not quite kept on to Carlisle, but the Gretna Junction slack was a trifle exaggerated, and in any case the sum of the Dumfries–Annan and Annan–Carlisle times showed nothing against the engine, although the tare load of 316 tons was not far off the 335 tons maximum allowed from Dumfries to Carlisle. The pilot was retained in the last run, and a very smart time of 19¼ min. was made to Annan with the 380-ton load, but signals severely on at Gretna Green prevented a punctual arrival.

In the north-bound direction I have tabulated the runs as between Dumfries and Glasgow only, as only three of them commenced at Carlisle, so far as I was concerned. No. 502, on the second trip, did very badly from Carlisle to Dumfries with only 175 tons, taking 42¾ min. non-stop, instead of the 41 min. allowed. On the fourth run No. 496 did quite brilliantly with 235 tons, passing Rockcliffe, 4·1 miles, in 6½ min.; touching 61 before Gretna and easing to 51 through the junction, we cleared the latter, 8·7 miles, in 11¼ min. At Dornock, practically on the level, we were running at 65 m.p.h., passing that station, 14·6 miles, in 17

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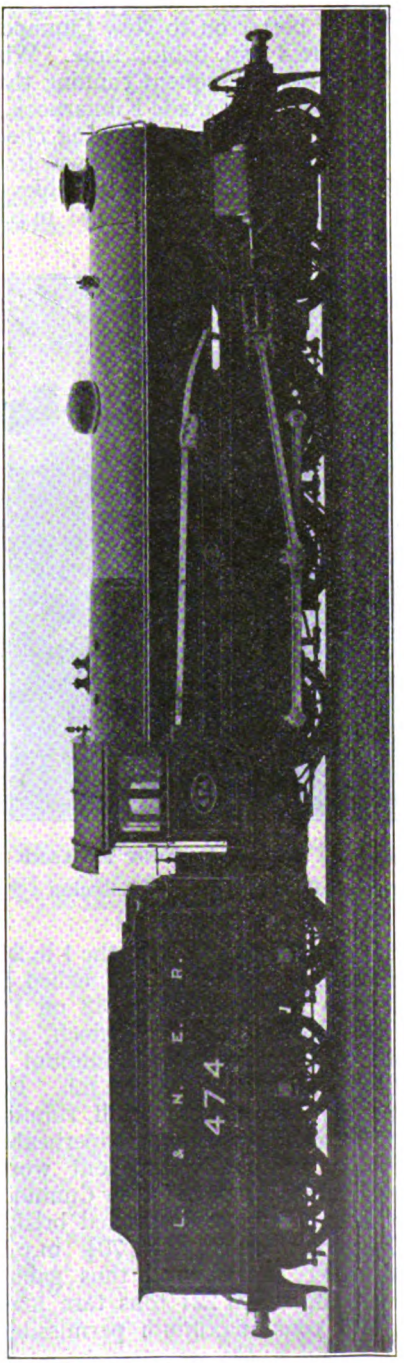
min. 35 sec., ; and the conditional stop at Annan, 17·6 miles, was made in 20 min. 50 sec. Re-starting, we were through Ruthwell, 7 miles (including 2¾ up at 1 in 200-250) in 9½ min., breasted the further mile at the same inclination and passed Racks, 11·6 miles, in 14 min. 50 sec. ; and reached Dumfries 15·5 miles, (stopping very slowly, as usual) in 19 min. 25 sec. Overall time from Carlisle to Dumfries, with ½-min. standing at Annan, was thus 40¾ min., instead of the 41 min. schedule, which makes no allowance whatever over and above the normal non-stop time for this conditional stop ; net time for the 33·1 miles was 37½ min. No. 511 did nothing like so well on Run No. 5 ; we took 12 min. to Gretna and 22 min. 55 sec. to Annan, and then, after 20 sec. standing, 21 min. 5 sec. on to Dumfries, total 44 min. 20 sec., or 3¼ min " down."

The first run from Dumfries to Kilmarnock is noteworthy as " featuring " one of the two superheated 4-6-0's—prior to the re-numbering No. 128 and now No. 513. But with all allowance for a heavy side-wind, the work performed with so light a load was no more than fair. Before reaching the long Auldgirth 1 in 200 we touched 56½ m.p.h., and on the grade fell to 46 ; the ¾-mile level before Closeburn brought us up to 51 m.p.h., and up the 6 miles at 1 in 148-150 from before Closeburn to the tunnel beyond Carronbridge we maintained 44½-45 m.p.h. ; touching 61½ m.p.h. at Ardoch, we took both the 4 miles at 1 in 180 to Sanquhar, and the 3½ miles mostly at 1 in 200 from Kirkconnel, at minima of 45½ m.p.h., and so passed New Cumnock at something nearer the extraordinarily exacting allowance of 44 min. than on any other run. After that the two p.w. cautions were observed to a slightly greater degree than on the other journeys—the first to 45 m.p.h. and the second to 36—and we did not exceed 65 m.p.h. in descending to Hurlford, but owing to that generous " three minutes," we succeeded in arriving punctually at Kilmarnock. On continuing the run, however, the engine developed leaky tubes, and failed at Stewarton, with the result that we were 43 min. late on arrival in Glasgow.

By contrast, No. 505 did very poorly from Dumfries to Kilmarnock on the second run, as she had done previously from Carlisle ; speeds on the 1 in 200 grade ranged about 44 m.p.h., and on the 150 round the 40 mark, so that we were 5 min. behind at New Cumnock ; but the



LONDON AND NORTH EASTERN RAILWAY.

Great Central 4-6-0 mixed-traffic locomotive, No. 474, as newly lettered and numbered. (See remarks in regard to No. 503, page 198.)

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"three minutes" again came to our assistance, and despite excessive caution down to Hurlford, we reduced the arrears to 1¾ min. on arrival. No. 502, with a somewhat heavier train, started from Dumfries more briskly than No. 505, and then practically reproduced the latter's times up to the tunnel, afterwards going very slightly better on to New Cumnock, where we were 4 min. behind time. With somewhat faster subsequent running than usual, we should have made Kilmarnock in 71 min., but for the p.w. relaying check above Hurlford. No. 496 continued from Dumfries the fine work already achieved from Carlisle; touching 57½ m.p.h. No. 511's effort was quite without incident, and resulted in the loss of a minute.

The north-bound run between Kilmarnock and Glasgow is rather easier than the south-bound, and presumably the timing is intended to include the Strathbungo conditional stop, which is made more often than not. The 9.50 a.m. from St. Pancras is allowed 2 min. more than the 12.15 p.m. over this length, and when the Strathbungo stop is made the 36 min. allowance is on the tight side, seeing that a slack is now called for at Neilston in this direction, while speed below Neilston barely ever exceeds 60 m.p.h. No. 505 would have managed it,

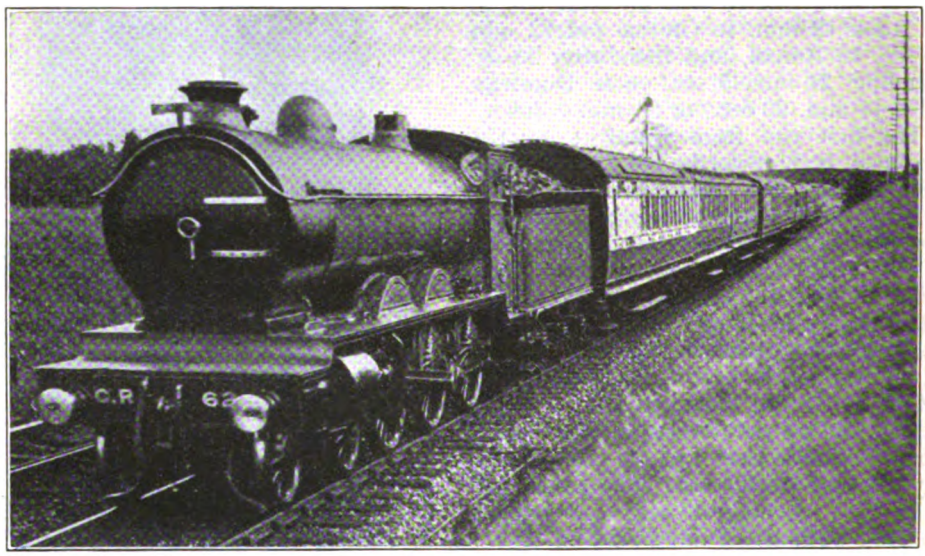

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*H. Gordon Tidey.*

Down West Coast express. Caledonian 4-6-0 locomotive No. 62, Pickersgill 2-cylinder design.

beyond Holywood, we went up the 1 in 200 at a minimum of 49 m.p.h.; touched 53 at Closeburn and maintained 43 on the 1 in 150; reached 62½ at Ardoch, and mounted to Sanquhar at a minimum of 48 and to Kirkconnel at 46½ m.p.h. For such lengthy continuous uphill running with a 235-ton train and a non-superheated engine, this was really excellent work, although even so we passed New Cumnock 2¾ min. late. But we descended briskly to Kilmarnock, sustaining 70½ m.p.h. after Mossgiel Tunnel, and thus gained a clear 2 min., with 221 tons tare load, against 240 tons maximum permissible. in column 2 (with a trifling loss of ½-min.), but for the signal check at the close; up 2 miles at 1 in 180 out of Kilmarnock we attained 39 m.p.h., and then fell back to 33½ on 1½ miles at 1 in 87, accelerated to 37 on a mile at 1 in 152, and fell finally to 23½ up all but 2 miles at 1 in 75 past Stewarton—not a bad performance.

But, for the size and power of the engine concerned, the running of the large 4-6-4 tank—No. 545— in the third column was wretched (this was apparently inefficient driving, as the same engine did quite well in the other direction); speeds at the four points mentioned above were 37,

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29½, 39 and 29 m.p.h. respectively, only the work on the upper part of the bank being superior to that of No. 505. After that we crawled down Neilston bank to such effect as to lose nearly a minute *without* the Strathbungo stop being called. No. 496's ascending speeds (column 4) were 38, 32, 39 and 24½ m.p.h.—a continuation of the good work already performed from Carlisle, which was by a fair margin the finest in both tables—and but for the p.w.r. check near Lugton we should have reached Glasgow, Strathbungo stop included, in 35¼ min., or 2¾ min. inside schedule. No. 511 also did fairly well, with speeds of 39, 29, 37 and 25 m.p.h.

In conclusion I give a table of running on the Caledonian route between Princes Street, Edinburgh, and the Central Station at Glasgow, designed chiefly to show the exceedingly good uphill running which is made by these trains out to Midcalder Junction. As the annexed profile shows,

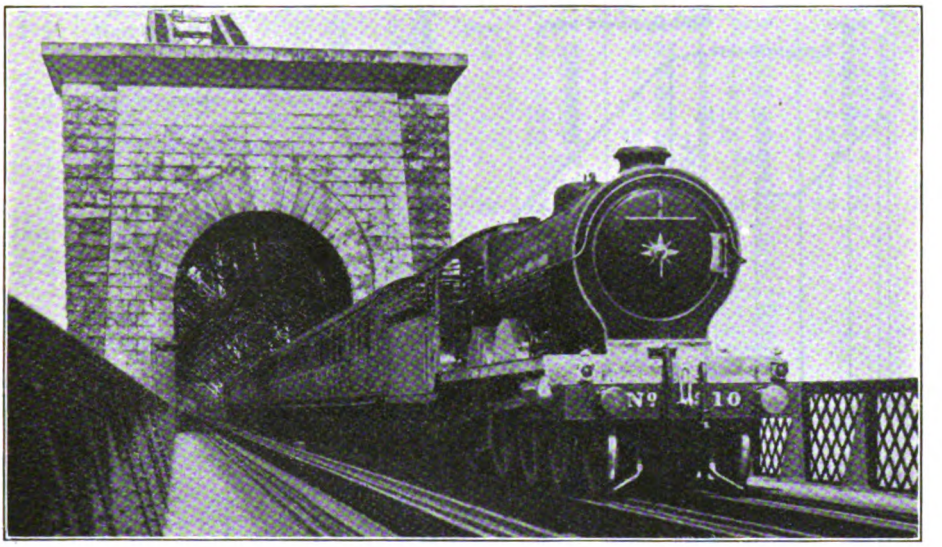

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*Leslie J. Thompson.*

Perth–Edinburgh express on the Forth Bridge.
North British 4-4-2 engine No. 510, "The Lord Provost."

On the whole one cannot but regard these runs as rather disappointing, the running, with few exceptions, being devoid of enterprise—in striking contrast, for example, to the Great Northern journeys which have just been described—with a tendency to loss of time rather than its recovery. Arrivals in Glasgow on runs 2, 3, 4 and 5, were 9¾, 4¾, 8¾ and 2 min. late, after starts 2½, 2½, 11¾ (this run by 496 was the one redeeming feature) and 0 min. late; time was slightly cut at Dumfries and Kilmarnock on each trip, so that none of the loss was due to station working. Coming south, we reached Carlisle 2¼ min. early on Run 1, on time on Run 2, 2¼ min. late on run 3 at Dumfries, 1 min. early on run 4, and 2¼, 6¾, and 3¾ min. late on runs 5, 6, and 7 respectively, although signals at Gretna were responsible chiefly for the lateness of the 5th and 7th runs. The 4-6-0 engines involved were in all cases (except the superheated No. 513) as rebuilt by Mr. Whitelegg.

after 2 miles' level start to Slateford, the climbing is continuous, without breathing space anywhere, and so far as Carlisle-bound trains are concerned, it is capped beyond Midcalder by the 5½ miles at 1 in 100 which lead to the summit at Cobbinshaw. Four of the runs were made on the Pullman corridor Glasgow-Edinburgh 70-minute expresses, two with "Dunalastair III" class engines, and two with the efficient superheated engines of the "Dunalastair II" class; while the last two were on the 10.0 a.m. West Coast express, which, with both Cobbinshaw and Beattock summits to negotiate, has no time to spare

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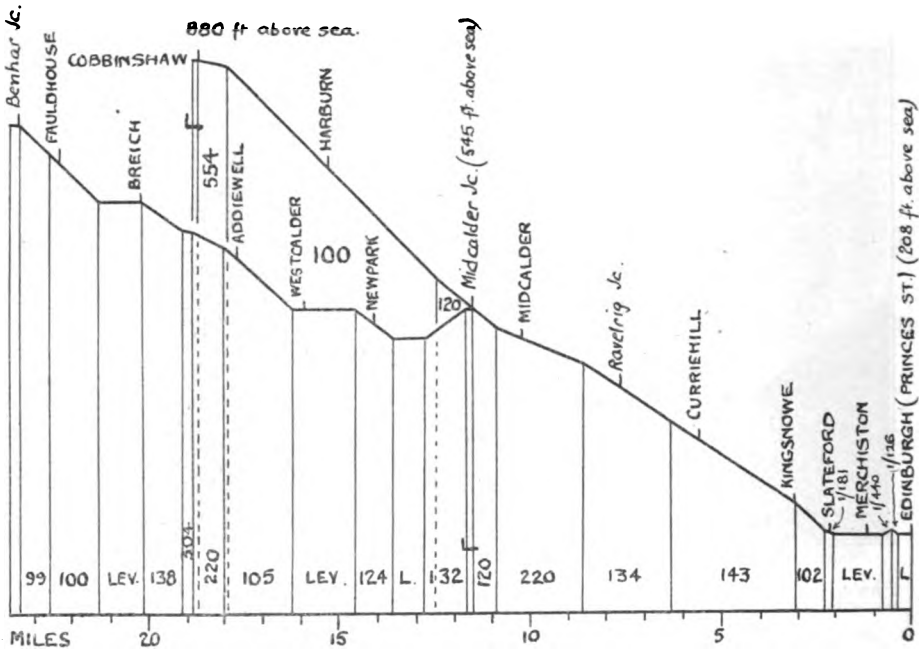
on a booking of 2 hours for the 100½ miles to Carlisle. The climbing speeds are all detailed below the table, and little further need be said of them other than an expression of admiration that engines of such modest dimensions can run mile after mile at 1 in 143-134 with a 200-ton train at average speeds of round about 40 m.p.h., and with a 230-ton train at 37 m.p.h. and more. Note should be taken, too, of the subsequent accelerations up 1 in 220, in one case to as much as 48 m.p.h. with a 200-ton train—a very fine feat for No. 769, which carries off principal honours in the table.

time was improved on by 1½ min. On the last-mentioned run, too, we ran quite smartly from Holytown to Glasgow, gaining 2½ min. on the 19 min. schedule, which itself is a minute faster than normal; maximum speed was 67 m.p.h. before Uddingston (where we slackened to 45) and 65 at Rutherglen, with a minimum of 47½ at Newton. It is clear from the running times that the one-stop trains could be expedited without difficulty to a 65-min. run, and with such loads a non-stop timing of 60 min. should be easily feasible.

On the east-bound journey the climbing



PROFILE, GLASGOW—EDINBURGH ROUTE, LONDON MIDLAND AND SCOTTISH RAILWAY.

On the easy length beyond Midcalder Junction the speeds attained on runs 1, 2, 3 and 4 were 55, 60, 60 and 60 m.p.h., while the minima up 2 miles at 1 in 100-99 to the summit at Benhar Junction were 31½, 39, 37½ and 40 m.p.h. respectively. The drivers on runs 2, 3 and 4 found it quite impossible to spin out 15 min. over the 9·9 miles from Benhar to Holytown, even allowing for the restricted speed over colliery workings; the 8.50 a.m. ex-Edinburgh (column 1) has, however, to put in three stops instead of one in the 70-min. schedule, and is allowed 2 min. less over this section, but even this is considerably more broken, and there is also more facility for fast running on the falling gradients, so that the east-bound work is, on the whole, easier. No. 897, with 205 tons, passed Rutherglen in 6¼ min., at 45 m.p.h., and Uddingston in 13 min. 10 sec., at 55 (after falling to 43 at Newton), reaching Holytown in 20 min. 55 sec.; minimum on Bellshill bank (2¼ miles at 1 in 70) was 28 m.p.h. From Holytown we passed Omoa in 6¾ min., at 30 m.p.h., (attained up a grade chiefly 1 in 80 and averaging 1 in 90), and Benhar Junction in 19¼ min., at 33 m.p.h., maintained up 4 miles at 1 in 100-99; after

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that the easiest running, never exceeding 60 m.p.h., sufficed to bring us into Edinburgh in 69½ min., inclusive of 2 min. standing at Holytown. No. 923, a superheated "Dunalastair III," did even better with 175 tons, passing Rutherglen in 51½ min., at 52½ m.p.h., and Uddingston in

I must not forget the continuation to Carlisle of the 10 a.m. journeys appearing in colums 5 and 6 of the last table. The 7·1 miles between passing Midcalder Junction and the summit at Cobbinshaw occupied 12 min. 35 sec. and 11¾ min., with sustained speeds averaging 33 and

L. M. & S. (CALEDONIAN) RAILWAY:—EDINBURGH–GLASGOW.

Distance.	Engine, 4-4-0, No. Load (axles): Load (tons tare): Load (tons full):	Schedule.	897N 26 193 200	Schedule.	895N 26 193 200	769S 26 193 200	766S 30 222 230	926N 32 216 230	78PS 34 241 255
Miles.		Min.	M S.	Min.	M. S.	M. S.	M. S.	M. S.	M. S.
0·0	Edinburgh	0	0 00	0	0 00	0 00	0 00	0 00	0 00
1·2	Merchiston ..	3½	3 35	pass	pass	pass	pass	pass	pass
		4	4 35	3	3 45	3 25	3 15	3 40	3 30
2 2	Slateford	—	6 50	—	5 00	4 40	4 30	4 55	4 45
3·0	Kingsknowe ..	—	8 40	—	6 30	6 05	5 55	6 20	6 20
5·5	Currie Hill	—	12 45	—	10 30	9 55	10 05	10 20	10 10
7·4	Ravelrig Junc. ..	—	15 40	—	13 15	12 50	13 10	13 25	13 10
10·1	Midcalder ..	19¼	19 55	—	pass	pass	pass	pass	pass
		20	20 20	—	17 10	16 35	17 15	17 35	17 10
11·3	Midcalder Junc. ..	22	23 45	18	18 45	18 05	18 50	19 25	18 50
15·9	Westcalder	—	29 20	—	24 25	23 10	24 05	—	—
20·2	Breich	—	35 20	—	30 25	28 55	30 00	—	—
23·2	Benhar Junc. ..	37	39 50	34	34 30 p.w.r.	33 00	34 05 p.w.r.	—	—
30·5	Omoa	46	48 15	44	43 55	41 50	43 25	—	—
33·1	Holytown Junc.	50	51 20	49	47 35	45 50	47 05	—	—
		51	52 35	50	49 30 sigs.	50 55	49 15	—	—
37·7	Uddingston	57	58 30	57	57 30	57 20	55 40 sigs.	—	—
43·0	Rutherglen	63	64 20	63	64 35	63 40	62 20 sigs.	—	—
46·2	Glasgow	70	69 05	70	70 00	68 45	69 15	—	—
46·2	Net running times (min.)	*68	†63½	69	65½	64¼	65½	—	—
Speed at top of 1 in 102 (m.p.h.) ..			31·5	—	36·9	—	36·0	37·8	36·9
,, ,, 1 in 143 ,, ..			39·1	—	40·2	40·2	37·5	37·5	38·9
,, ,, 1 in 134 ,, ..			38·1	—	40·9	40·2	37·5	36·9	39·5
,, ,, 1 in 220 ,, ..			40·9	—	45·5	46·4	43·7	40·9	45·0
,, Midcalder Junc. (m.p.h.) ..			—	—	45·5	47·9	43·3	38·5	45·0

Thick horizontal line indicates booked stop.

* Including Merchiston and Midcalder stops. † Excluding Merchiston and Midcalder stops.
N: Non-superheated "Dunalastair III" class. S: Superheated "Dunalastair II" class.
P.S.: Superheated Pickersgill type.

12 min. 5 sec., at 55; going rather more easily up to Holytown, we stopped in 19 min. 50 sec. From there we passed Omoa in 6¾ min., at 33 m.p.h., and Benhar in 17¾ min., at 34; and again with a very leisurely descent we reached Princes Street in 67 min. 50 sec., inclusive of 1¾ min. at Holytown.

34½ m.p.h. on the 1 in 100; the whole climb of 18·4 miles from the start therefore took 32 min. and 30 min. 35 sec. Naturally, the more powerful superheated Pickersgill engine had the advantage, even though more heavily loaded, but in justice to the "Dunalastair III," it must be said that the latter had to contend with

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a violent S.W. wind. The 7·4 miles from Cobbinshaw to Carnwath occupied 7 min. and 7 min. 20 sec., with maxima of 71½ and 67 m.p.h., and Strawfrank Junction, 27·4 miles, was passed at severely reduced speed in 40 min. 50 and 5 sec. from Edinburgh. The 6·3 miles from Strawfrank up to Symington took 8 min. 10 sec. on both runs; the 3·7 miles gentle descent to Lamington 3 min. 55 and 45 sec., with maxima of 64½ and 67 m.p.h.; then speeds fell to 49 and 53½ m.p.h. at Abington, 43½ and 47½ on the 142-152 before Elvanfoot with a rise to 52½ and 53½ on the short Elvanfoot "level," and finally to 35½ and 38 on the 2¼ miles at 1 in 99 to Beattock Summit. Times were 16 min. 55 sec. and 15 min. 40 sec. from Lamington to Summit, making totals of 69 min. 50 sec. and 67 min. 40 sec. for the 50·9 miles from the start.

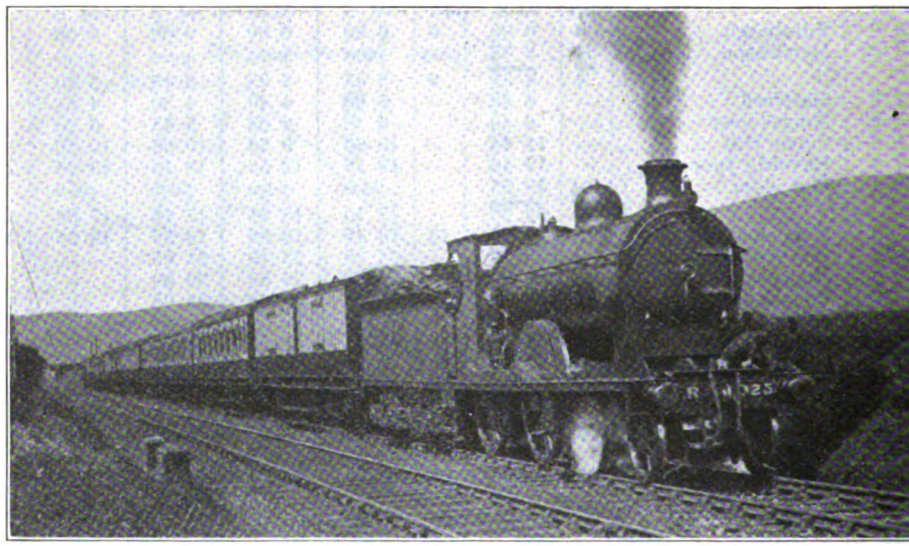

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*H. Gordon Tidey.*

Glasgow–London express near Beattock Summit.
Caledonian 4-4-0 locomotive No. 925.

It was, by contrast, an easy task to cover the remaining 49·7 miles to Carlisle in 48 min. 25 sec. and 52¼ min. respectively; the times were 9 min. 20 sec., and 10¼ min. down to Beattock, 10 miles; 13¼ min. and 14 min. 25 sec. on to Lockerbie, 13·9 miles; 16 min. 35 sec. and 17 min. 55 sec. from Lockerbie to Gretna, 17·2 miles; and 9 min. 15 and 40 sec. on into Carlisle, 8·6 miles; so we completed the respective journeys in 118¼ min. and 119 min. 55 sec. The non-superheated engine gave the brighter running south of Summit, and, indeed, the fastest Caledonian running over this section that I have noted for some time. We touched 75 m.p.h. momentarily on Beattock bank, passed Beattock Station at 70½, but had got down to 64½ at the foot of the incline, near Wamphray; we reattained 67 by Nethercleugh, however, and went up the 1 in 200 to Brackenhill at a minimum of 53½ m.p.h.; then, on both stages of the 1 in 200 descent to Gretna we maintained 69 m.p.h., instead of the much more usual present-day "stroll" of about sixty. For comparison with the running of the afternoon express, it may be added that the times from passing Symington on the two runs to Carlisle, 66·9 miles, were 69¼ min. and 71 min. 40 sec. With these excellent Caledonian performances I must now conclude, considerations of space compelling the holding over of further Caledonian runs until a future issue.

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Locomotive and Train Working in the latter part of the 19th Century.

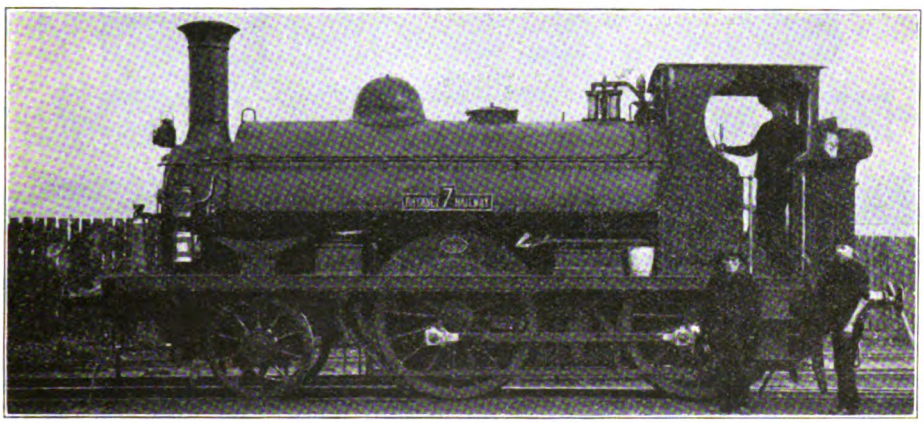
THE RHYMNEY RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE passenger train services were two in number, the main line trains between Cardiff and Rhymney Bridge, a distance of 22 miles, and those between Cardiff and Merthyr, 24 miles. Both sets of trains used the same metals between Cardiff and Ystrad Junction (13½ miles), where the Merthyr trains diverged to the north-west and travelled over the Great Western and the joint Merthyr and Great Western lines previously mentioned.

It has always been a puzzle to me how these two services were worked by the four passenger tank engines available before 1890. There were at least five trains in each direction on the line to Rhymney, and four on the Merthyr section, all of which ran through to Cardiff. The four passenger engines consisted of Nos. 7, 8 and 9, 2-4-0 saddle tank engines which had been rebuilt, 1880–1, from the original tender engines. The other engine, No. 16, was similar, but had side tanks, and was the only side tank engine on the line. The coupled wheels of all of them were 5 ft. 3 in. in diam., and the cylinders 16 in. by 20 in.

The service was such that one engine had to be stationed at Merthyr and another at Rhymney to work the first morning trains to Cardiff, and presumably the other two engines were quartered at the last-mentioned shed. These four engines never seemed to be off duty, and my recollection is that only on one occasion, when a goods tender engine of the No. 1 class was used, did I ever see any passenger train leave or arrive at Cardiff station without one of these four at the head. On my journeys between Merthyr and Cardiff, Nos. 7, 8 or 9 were always in charge. Never were there any four harder worked passenger tank locomotives, which appeared to solve the somewhat difficult problem of being in two different places at the same time. The schedule of their train working must



2-4-0 SADDLE-TANK PASSENGER ENGINE, No. 7.

Built by Vulcan Foundry Co., 1858; rebuilt, 1880.
Coupled wheels, 5 ft. 3 in. diam. Cylinders, 16 in. by 20 in.

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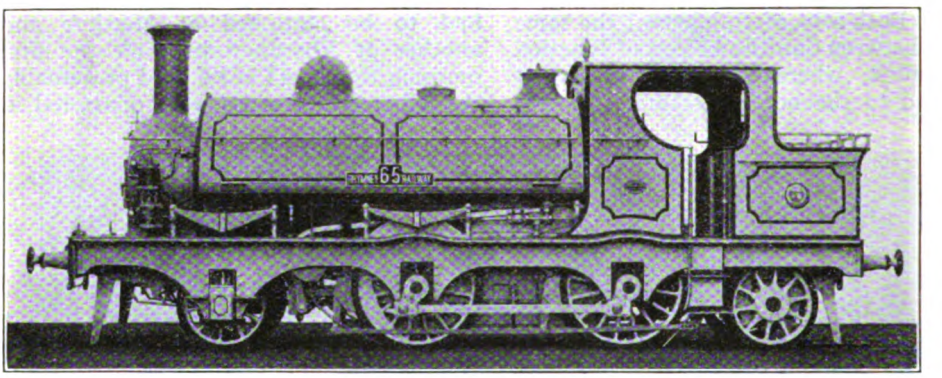
have been a veritable *tour de force* on the part of Mr. Lundie and of Mr. Jenkins, the actual locomotive superintendent. All four were fitted with the Westinghouse brake, which was used on most of the Rhymney passenger trains.

But even the Rhymney lcomotives had to go in for repairs at some time or other, and an increase in the passenger service about 1890–1 to four down and five up Merthyr trains, and to six trains each way on the Rhymney route, with an additional morning train to Bargoed, necessitated further passenger engines. These were supplied in 1890 by the Vulcan Foundry Like their predecessors, they were fitted with the Westinghouse brake.

The older 2-4-0 tank engines, Nos. 7 to 9, continued at work until 1894-5, when they were withdrawn from service after 36 years of hard work. The side tank engine No. 16 lasted a few years longer.

It may be added that of the later 2-4-2 tank engines, three, Nos. 62 to 64, have been converted during the present century to 0-6-2 goods tank engines. Nearly all the passenger trains of the Rhymney Railway have in later years been worked by six-coupled radial side tank engines of more modern designs.



2-4-2 SADDLE-TANK ENGINE, No. 65 (62-66 Series).

Built by the Vulcan Foundry Ltd., 1890.
Coupled wheels, 5 ft. 1 in. diam. Cylinders, 17 in. by 24 in.

Company, of Newton-le-Willows, who constructed five 2-4-2 saddle tank engines of somewhat unique design. The leading carrying and the two coupled axles had outside bearings, but the trailing end was carried by a radial axlebox with inside bearings only. The use of saddle tanks instead of side tanks, which had become obsolete on other railways for passenger traffic, was also unusual. It seems not unlikely that Mr. Lundie himself was the moving spirit in the adoption of this design, and to the last he was a staunch believer in double frames and saddle tanks.

These five engines, Nos. 62 to 66, had 5 ft. coupled wheels, 3 ft. 8 in. leading and trailing wheels, and 17 in. by 24 in. cylinders. The boilers had a total heating surface of 1,152·6 sq. ft. and carried 150 lb. pressure. The total weight in working order was 50 tons 8 cwt., of which about 27¼ tons was carried by the coupled wheels.

The colour of the Rhymney engines was dark green picked out with black bands and white lines. The underframes were chocolate colour. The numbers of the engines were indicated by large brass figures fixed on the front of the chimney, in addition to large and elaborate number plates on the boiler barrel or saddle tank.

The Westinghouse brake was also fitted to several of the 0-6-0 goods tender engines, Nos. 1 to 6, for these engines were the ones employed on passenger trains when the four-coupled tank engines had to be laid up. The Westinghouse brake was used on most of the regular passenger trains.

But it was not the only brake employed on the Rhymney Railway. In the "Special Regulations" for passenger trains in 1891 it was stipulated that excursion trains which had to work over the incline between Cyfarthfa Crossing

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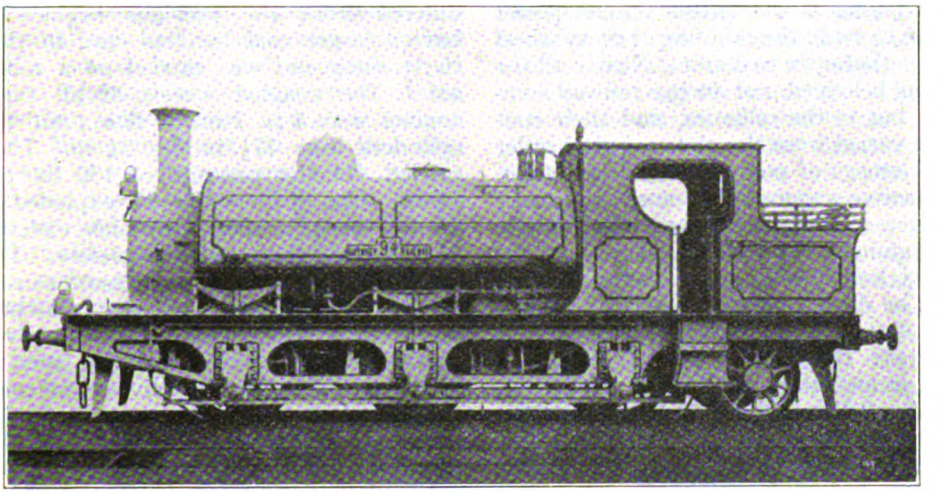
Junction and Merthyr had not to exceed a load of more than 15 six-wheeled coaches, and as far as possible they were to be fitted with the vacuum brake, and be worked by an engine so fitted.

The Rhymney had a number of the saddle tank goods engines fitted with the Eames brake, an American form of vacuum brake. To describe this brake fully would take up too much space, but a few words about it may be added. It was an automatic brake with two lines of pipe which extended throughout the train. One pipe, called the automatic pipe, was connected with a valve box on each vehicle, and from this box there were two connections, one to a reservoir, and the other to a brake cylinder. The second pipe, called the plain pipe, had a connection directly to each cylinder. The hose coupling between the coaches had valves which closed when the couplings were not united. The engine was fitted with two ejectors, of which the small ejector was kept constantly at work for creating and maintaining the vacuum in the automatic pipe and reservoirs, and the large one was used when required to create a vacuum in the plain or non-automatic pipe. To work the brake the small ejector was started and a partial vacuum was produced in the automatic pipe, valve-box, and reservoirs. To apply the brakes the large ejector was worked, and a partial vacuum formed in the plain pipe and all the cylinders. A check valve placed in each valve box prevented air from passing from the automatic pipe to the cylinders. The brake was released by letting air into the plain pipe and cylinders by means of a valve on the engine. If the train broke in two, the pipe couplings separated; the automatic pipe remained open and destroyed the vacuum in the pipe and on one side of a diaphragm in the valve-box. This diaphragm moved and opened a passage between the reservoir and the cylinder, thus letting the air out and applying the brake. Each van had a valve for the purpose of admitting air to the automatic pipe, thus giving the guard a means of applying the brake. The brake was automatic if the train broke into two, or if the automatic pipe alone was damaged. But if the non-automatic pipe was damaged the brake did not act with proper effect. The Eames brake was somewhat complicated, and is consequently difficult to describe without diagrams.



0-6-2 SADDLE-TANK MINERAL LOCOMOTIVE, No. 94.

Built by Hudswell, Clarke & Co., Leeds, 1900.
Coupled wheels, 4 ft. 7½ in. diam. Cylinders, 17½ in. by 24 in.

Brake power on the mineral trains descending the valleys had to be carefully regulated. Wagon brakes had to be pinned down in sufficient numbers to command the train, but it was strictly enjoined that skidding the wheels had to be

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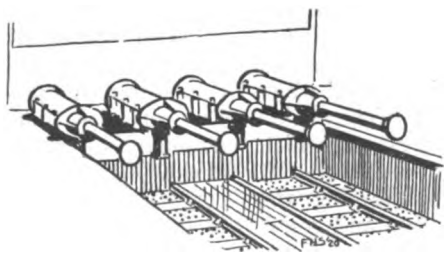
avoided, and that if any wheel was found to be skidding the guard and brakesman would be severely punished. To prevent the brake blocks from burning, the drivers, when descending the banks, had to keep their rail water taps open, and the guards were instructed to put the fire out if any brake blocks were found to be burning at the bottom of the incline.

Naturally, "skidding" the wheels had to be avoided if possible, for "flats" on the tyres are an unmitigated nuisance. But whether it was within human power always to avoid the skidding of every wheel is somewhat open to doubt. Nearly all the wagons belonged, not to the railway company, but to the collieries, and their condition varied from the alpha of good order to the omega of comparative decrepitude. If defective wagons of the omega type were discovered, the guard, whose duty it was to examine them before they left the sidings, had to put their brakes right if it could be done, or leave them behind, but if the latter course were adopted, he had to report the matter at the Manager's office immediately on arrival at Cardiff. Now the "Manager" in this case was the Superintendent of the line, and this latter functionary was Mr. C. Lundie, and Mr. Lundie was also "Lord High Executioner." The guard was therefore occasionally on the horns of a dilemma; he had to avoid the Scylla of skidding with its consequent "severe punishment," and also the Charybdis of the Lord High Executioner's carpet should he leave an important wagon behind.

The remaining engines of the Rhymney Railway which were constructed by various makers from 1890 until the end of the century were Nos. 57 to 61, 67 to 72, 7 to 9, and 73 to 105. They were all similar to the illustration of No. 94, which shows one of the class constructed by Messrs. Hudswell, Clarke & Co., of Leeds, in 1900. These also were saddle tank engines with double frames, so beloved of Mr. C. Lundie, but they differed from the previous engines in having larger coal bunkers, and in that the trailing end was carried on a radial axle. The coupled wheels of all these engines were 4 ft. 7 in. in diam., and the cylinders were 17½ in. by 24 in. They carried a boiler pressure of 150 lb. per sq. in. One of them, No. 97, exploded at Cardiff sheds in 1909 with such violence as to destroy the engine completely. The explosion was due to overpressure caused by the carelessness of a fitter who had repaired the Ramsbottom safety valves and placed a washer over the lever in such a position that the valves were completely locked.

In concluding this account of the Rhymney Railway as it was during the latter part of the 19th century I wish to express my indebtedness to Mr. Prosser, the last General Manager, prior to amalgamation with the Great Western Railway last year, for information supplied from the old working time-tables.



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Traffic Improvements at King's Cross, London and North Eastern Railway.

IN common with several other of the great terminal stations, King's Cross, the London headquarters of the late Great Northern Railway, was originally laid out on the principle of virtually complete separation of the arrival and departure sides, so far as the running movements of trains were concerned. During recent years, however, the terminal has had to deal with suburban traffic on a large and growing scale. Thus, whereas in the past most of the suburban trains were operated to and from Moorgate Street (at one time also to and from destinations south of the Thames via Ludgate Hill), for which the up and down connections with the Metropolitan Railway on either side of the main station were distinctly convenient, for some years now there have been quite as many suburban trains arriving in or departing from the main line station. For a considerable time, indeed, it has been the practice during the busy periods to schedule many of the down suburban trains from Moorgate Street to pass the platform provided for them on the steep incline from the Metropolitan Railway, suburban traffic from the main line station itself being largely provided for by separate trains.

The latter, however, introduced serious difficulties, in that they necessarily ran into one or other of the arrival platforms, and after unloading their passengers had then to be shunted across to the other side of the station for departure. There existed, it is true, an up carriage line through the centre one of the three parallel tunnels known as the Gas Works tunnels, just north of the station, but this was operated on a permissive basis and reserved for bringing into the station empty trains and light engines, and could not always be used for shunting movements. Consequently, in shunting trains across from the arrival to the departure side, one of the down main lines had to be made use of, thus adding seriously to the occupation of that road, as it had to serve to some extent as a shunting neck, besides which it was also utilised for the movements of engines released from the arrival platforms passing to the engine sidings on the departure side. These transfer movements added not only to the engine and train movements conducted within station limits, which were at times liable to conflict with the movements of departing passenger trains, but also necessitated the provision of considerable margins between the times of arrival of particular trains and the times at which either vehicles or engines could be scheduled to leave the station on other turns.

Primarily to ease the situation thus indicated, and as part of what will eventually be a much larger improvement scheme affecting the station as a whole, the up carriage line has been equipped as a standard running line, being now known as the up relief line, so that up trains can run directly into all the platforms on the departure side. No point alterations have been involved, but the signalling as a whole has had to be reorganised extensively, and, in connection therewith, the principles of three-position and upper-quadrant signalling have been adapted to the circumstances of the situation in a manner which introduces several interesting and novel features.

This work was carried out under the authority of Mr. C. H. Dent, late General Manager, by Mr. C. J. Brown, C.B.E., Chief Engineer, in conjunction with Mr. C. J. Selway, C.B.E., then Superintendent of the Line, and we are indebted to all these gentlemen for facilities for inspecting the work, and to Mr. Brown particularly for the plans reproduced and for technical information utilised.

There are three parallel tunnels immediately north of the station yard, the Gas Works tunnels (528 yards long). That in the centre, which was the one constructed when King's Cross was opened in August, 1850, contains down main line No. 1 and the up carriage line, which now becomes the up relief line. The tunnel on the down side contains the down slow line and down main No. 2, while the third tunnel, on the up side, accommodates the up main and up slow lines.

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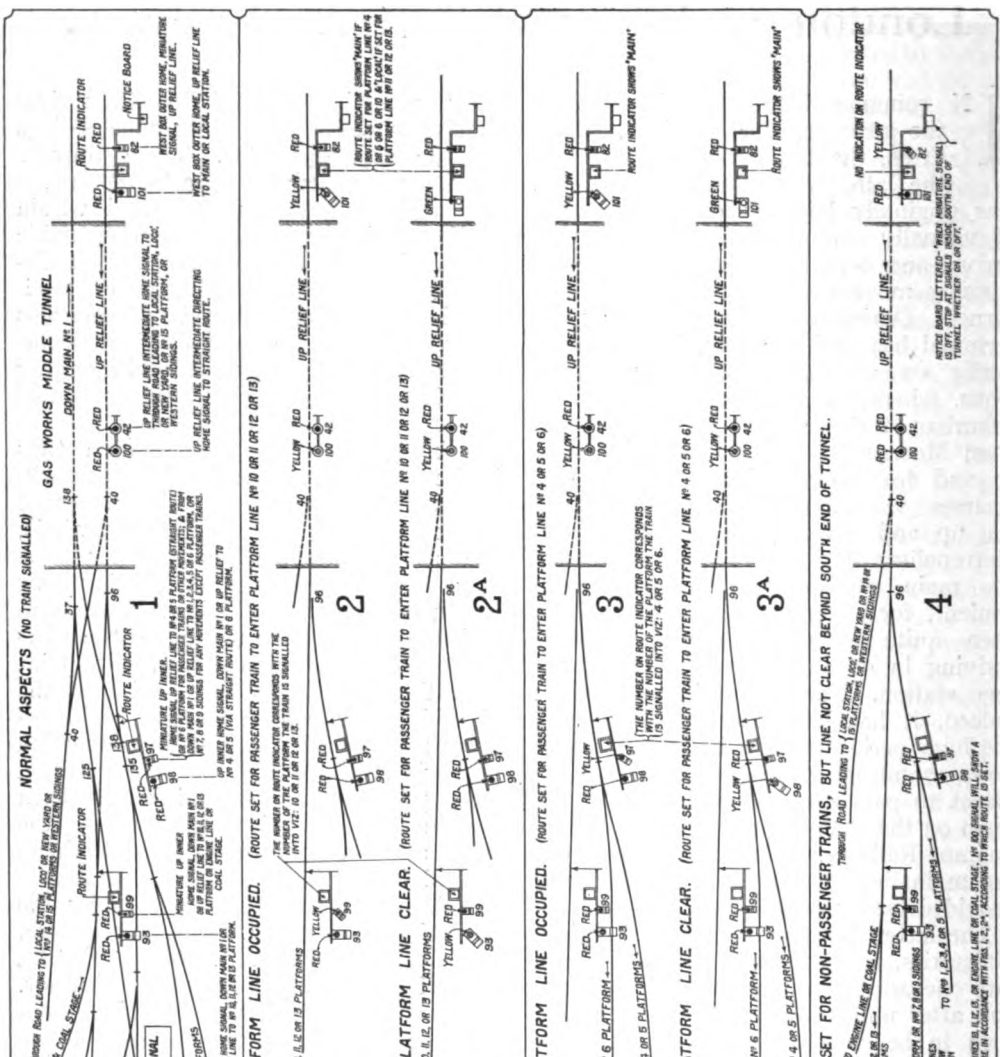
NORMAL ASPECTS (NO TRAIN SIGNALLED)
GAS WORKS MIDDLE TUNNEL
DOWN MAIN No 1
UP RELIEF LINE
ROUTE INDICATOR
NOTICE BOARD
WEST BOX
PLATFORM LINE OCCUPIED. (ROUTE SET FOR PASSENGER TRAIN TO ENTER PLATFORM LINE Nº 10 OR 11 OR 12 OR 13)
PLATFORM LINE CLEAR. (ROUTE SET FOR PASSENGER TRAIN TO ENTER PLATFORM LINE Nº 10 OR 11 OR 12 OR 13)
PLATFORM LINE OCCUPIED. (ROUTE SET FOR PASSENGER TRAIN TO ENTER PLATFORM LINE Nº 4 OR 5 OR 6)
PLATFORM LINE CLEAR. (ROUTE SET FOR PASSENGER TRAIN TO ENTER PLATFORM LINE Nº 4 OR 5 OR 6)
ROUTE SET FOR NON-PASSENGER TRAINS, BUT LINE NOT CLEAR BEYOND SOUTH END OF TUNNEL.
1
2
2A
3
3A
4

CHART SHOWING SIGNAL INDICATIONS UNDER VARIOUS CONDITIONS.

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There are, in the main station, 11 roads, of which the five in the arrival section all give access to platforms. In the main line departure station only the outermost of the six lines serve passenger platforms. Previously, the five arrival platforms were known as Nos. 1, 2, 3, 4 and 5 arrival, respectively, a separate numeration being employed for the departure platforms. All lines have, however, been renumbered from the arrival side, so that while No. 1 arrival is still No. 1, No. 1 departure is now No. 10, provision being made in the intermediate numbers for two parcels platforms and proposed future extensions. These numerals are shown in large figures on the outer faces of the northern wind screens of the "train sheds." On the departure side, but outside the departure "train shed," there are three other platform lines, previously known as E (largely used for main line trains) and now known as No. 11, and D and C, now numbered 12 and 13 and used mainly for the departure of suburban trains. Outside these lines are the engine sidings, with turntable, coal stage, &c., and beyond these, again, is the steep incline with platform, now known as suburban No. 14, used by down trains from the Metropolitan Railway. At the back of this platform is a further terminal line and platform, known as platform No. 15, together with a milk platform and horse and carriage loading docks.

The connections of these various lines with the respective lines through the three Gas Works tunnels may now briefly be reviewed. The down slow line can be reached directly from platforms 11, 12 and 13, and all roads beyond. Down main line No. 2 has access from all roads from No. 6 upwards, while down main No. 1 can be reached from any line within station limits. The up carriage (now up relief) line similarly has connections to every line within the station, but the up main line gives access only to platforms 1 to 5, and the up slow line, which is almost exclusively used by trains to the Metropolitan Railway and which serves the York Road platform, gives access only to No. 1 in the main station.

Station working is controlled by two cabins, the East box, adjacent to No. 1 platform, containing 100 levers, and being concerned chiefly with up traffic, while the West box, situated at the north end of Nos. 5 and 6 platforms, and containing 140 levers, deals with traffic on the departure side, together with shunting within station limits. Two other cabins have to be considered, Belle Isle down and Belle Isle up, both beyond the north end of the Gas Works tunnels.

The area between the platforms and the mouths of the Gas Works tunnels is very complicated, owing to the large number of connections and cross-overs which have had to be provided within the relatively short distance available. Indeed, certain cross-overs and connections are partly situated within the middle tunnel in order to obtain sufficient distance. Under the control of Belle Isle down cabin, at the north end of the Gas Works tunnels, are the down slow line and the down main lines Nos. 1 and 2, which here join to form the down fast, also the connection to the engine sheds, while Belle Isle up cabin governs, in addition to the three up lines through the tunnels, interchange connections between the up main and up slow lines, also an engine loop which has connection with the engine shed on the down side.

As hitherto signalled, empty trains or light engines reached the up carriage line from either the up main or the engine loop line, by permission of Belle Isle up cabin, and their entrance to the tunnel was controlled by two suspended ordinary semaphore signals at its mouth, viz., the up carriage home and a fixed up carriage distant below it. Shortly before reaching the exit from the tunnel, and in advance of the connections and cross-overs, some of which, as already mentioned, are situated within the tunnel itself, a disc signal was provided at which all trains and engines were required to come to a stand before proceeding further, whether it was at danger or not.

From this point the further movements of trains were controlled by various disc signals for the east side and discs and semaphores for the west side leading to the respective points in this complicated area. Thus, disc signal No. 98 gave general permission to proceed towards the west side of the station. Arm 99, on a double bracket post, controlled movements towards the west side also.

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UPPER QUADRANT SIGNALS AT NORTH END OF GAS WORKS TUNNELS.

Main Arm at 90 degrees, Route Indicator showing.

The other arm of this post governed backing movements from down main No. 1 to the west side.

All movements thus provided for, including those of trains or engines on the up carriage line as far as the disc signal within the tunnel already mentioned, were, therefore, of a shunting character. Owing to the complications, and the large number of points and connections crowded into small space, it was virtually impossible to give complete indications of all movements, and discs controlling movement from stage to stage had to suffice. This arrangement has worked well for many years, but obviously trains conveying passengers could not be worked into the station by this route; hence the need for alterations and the new equipment about to be described.

In considering how to adapt the up carriage line for trains conveying passengers, the problem was to retain also the permissive features of working. As now equipped, this is achieved by having, in addition to main signals which satisfy the rules under which passenger trains may be run, miniature arms which control the movements of empty trains and engines, as previously provided for, with the further improvement that, by using route-indicating appliances, drivers are now given full information as to where they are proceeding, whether with passenger trains or under shunting conditions.

The first of the new signals is at the north end of the Gas Works tunnels, close to Belle Isle down cabin, but is worked from King's Cross West box, neither of the Belle Isle cabins having anything to do with it, except that Belle Isle up cabin controls admission to the up carriage (now up relief) line from the up main or the engine loop line, as heretofore. The new post here erected, in place of the suspended signals which have been dispensed with, carries two arms, both upper quadrant (an innovation for the Great Northern Railway). The upper one, No. 101, is power-operated, using apparatus supplied by the British Power Railway Signal Company, Limited, but installed by the Great Northern Railway. It is, moreover, of three-position type, and combines and replaces the up carriage home and up carriage distant signals above described. But whereas the latter was a fixed distant, applying to the disc signal in the tunnel, the 45 and 90 deg. positions of No. 101 repeat the indications of one or other of four new stop signals, Nos. 97, 98, 99 and 93, south of the tunnel, which control further movement into the terminus. Of these signals, Nos. 98 and 93 are main signals, while Nos. 97 and 99 are miniature arms indicating restricted movements.

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The main arm, No. 101, is equipped with a route-indicating mechanism constructed in the railway workshops. This is in the form of a rectangular box illuminated from within, and which shows on the front a blank face, or the words "main" or "local," according to the position of the signal. When the main arm is at 45 or 90 deg. one of these words appear, according to the route set for the train entering the station. When at 45 deg., a driver is warned that neither of the two new up main stop signals, Nos. 98 and 93, beyond the southern exit from the tunnel is "off," and that, therefore, he has not a clear run right into the terminus, but that, although neither Nos. 98 nor 93 is "off," one or other of the associated miniature signals Nos. 97 and 99 must be clear and that, while the train can enter the terminus, the platform for which the route is set is partly occupied.

UPPER QUADRANT SIGNALS AT NORTH END OF GAS WORKS TUNNELS.

Miniature Arm at 45 degrees, without Route Indicator.

Before signals Nos. 98, 93, 97 and 99 are reached, however, two disc signals, Nos. 100 and 42, are encountered in the tunnel itself, 80 yards from the southern exit. No. 100 constitutes, in a sense (though, as will be seen, it has a wider application) a tunnel repeater to the stop signals mentioned. It is, so far as the movements of passenger trains are concerned, regarded merely as a repeater, and if a passenger train is admitted to the tunnel, must be "off" and shows in that position a yellow light instead of green. No. 42 is purely a shunt signal controlling access to the cross-over in the tunnel, and when "off" also shows a yellow light. Both signals are subject to a special track-circuit control. As already indicated, the driver of a passenger train entering the tunnel under the control of the main arm, No. 101, knows that tunnel disc signal No. 100 must be "off" for him, and he is, therefore, next concerned only with one of the stop arms, Nos. 98, 97, 93 or 99. These are all upper-quadrant mechanically-worked two-position signals, going to the 45 deg. position. Nos. 98 and 93 control, respectively, entrance to platforms 4, 5 or 6, and 10, 11, 12 or 13; No. 97 entrance to platforms 1, 2, 3, 4, 5 or 6, and the sidings in addition; and No. 99 entrance to platforms 10, 11, 12 or 13, and engine line or coal stage. The posts are also equipped with route indicators, by which an indication is given to the driver of the particular route set for him. Shortly, therefore, if No. 101 is at 90 deg., the driver of a passenger train is thus made aware that he has a clear road, not only through the tunnel, but also that either No. 98 or No. 93 must be "off," thereby giving him a clear run into the platform shown on the route indicator applicable to the signal

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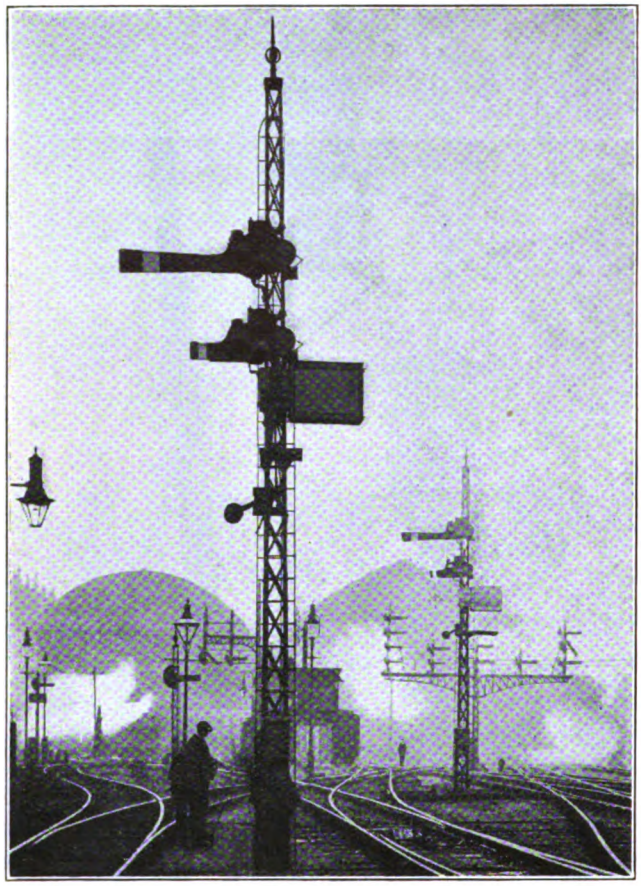

UPPER QUADRANT SIGNALS AT SOUTH END OF GAS WORKS TUNNELS.

Normal Signal Indications.

which is "off," right up to the buffer stops. Should, however, No. 101 be at 45 deg., the intimation is that neither Nos. 98 nor 93 is "off," but that one of the miniature lower arms is at 45 deg., authorising him to enter the indicated platform, though it is already partly occupied. The principal feature is that no passenger train can be admitted past No. 101 signal unless it can be given access into one of the platform lines.

No. 98 replaces the old disc signal of the same number at the tunnel mouth, and controls further progress into the eastern section of the terminus. No. 93 is placed at the site of the old No. 93 signal further along, amid the system of connections and cross-overs south of the tunnel, and governs entrance to the western side of the terminus. It replaces the bracket post, now dispensed with, which previously carried arms Nos. 93 and 99. The route indicators on both posts are of the Siemens Brothers and Co.'s roller-blind type. In this system a travelling blind bearing the necessary numerals or letters indicating the platforms to which the signals lead is rolled or unrolled until the required number or letter, according to the route set, is reached, at which point the blind stops. The lamp which illuminates the sign is then automatically switched on and the indication is clearly exhibited. The advantage of this type of route indicator is that the travelling blind is always close to the face of the casing, whereas in other types the indicators are usually at varying distances from the casing front and the illuminating lamps, thus causing different qualities of exhibition. These indicators are, at King's Cross, arranged to show in both directions, so that shunters and others on the ground in advance of the signal can observe the indications as well as drivers of approaching trains. The miniature arms are also employed for the permissive and shunting facilities associated with the up relief line when it is used only for empty carriage trains and light engines.

No passenger trains, as has been shown, may pass No. 101 unless the main arm is at 45 or 90 deg., but empties and light engines can enter the tunnel under the control of No. 82. In this case the route indicator does not apply, and a driver is instructed that he must stop at the disc signals Nos. 100 and 42 in the tunnel. To ensure this there is a special track circuit, T.C. 10 A., extending for 100 yards north of these disc signals, which operates when No. 82 has been pulled off, and, when a train or light engine has entered the tunnel under this signal, neither of these discs can be cleared, ***until this track circuit has been occupied***, thus ensuring that trains or engines are almost,

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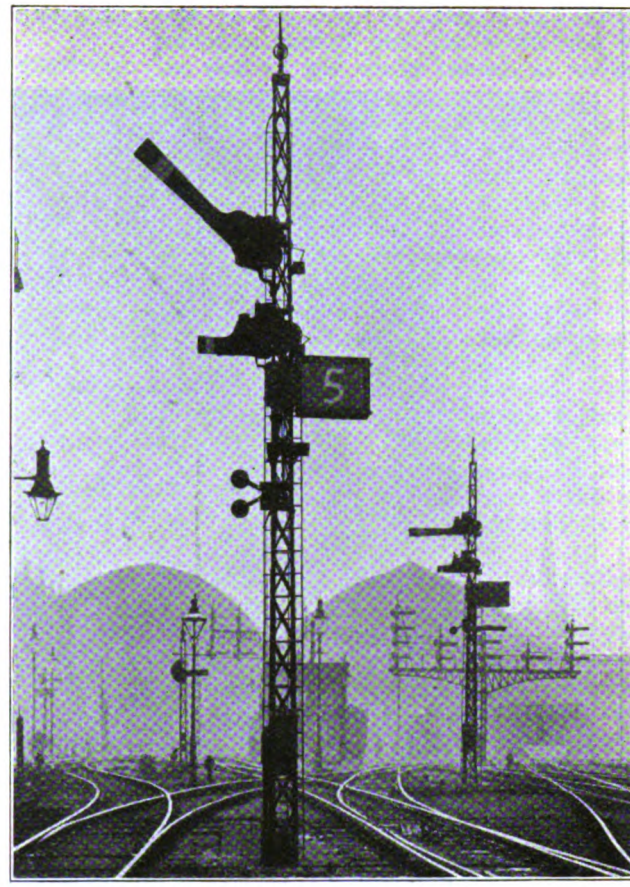
if not quite, at a stand before reaching them. As a further safeguard, the post which carries signals Nos. 101 and 82 has attached to it a board bearing in large letters the instruction, "When miniature signal is off, stop at signals 80 yards inside south end of tunnel, whether on or off." The instruction given by No. 82 at 45 deg. (yellow light) is thus: "Proceed with caution; intermediate home signals in tunnel at danger."

Of the two tunnel disc signals, No. 100 is known as the up relief intermediate home to straight route signal, and when off, in conjunction with No. 82, gives permission for a driver going to the western side of the station to proceed for further instructions as far as Nos. 93 or 99, or if going to the eastern side, that either No. 97 or No. 98 must be "off" for him, as owing to bad view the locking has been so arranged that in the circumstances No. 100 cannot be cleared until No. 97 or No. 98 has first been cleared. No. 42, up relief intermediate home to through road, local station, locomotive or new yard, similarly gives permission to proceed over the cross-over via the western route. Discs Nos. 98 (east of up relief line at tunnel mouth) and 132 and 137 (95 yards south of tunnel mouth and virtually replaced by No. 98 and its miniature arm No. 97) are dispensed with.



UPPER QUADRANT SIGNALS AT SOUTH END OF GAS WORKS TUNNELS.

Main Arm at 45 degrees, Route Indicator showing.

All the new signals show yellow when in the 45 deg. position, No. 101 being the only one which has a green indication also. For the information of fog signalmen at No. 101, a special indicator has been installed. This consists of a casing having three small light indicators, respectively red, yellow and green, according to the position of the main arm.

Owing to the difficult location and because of the serious obstruction to the view imposed by Battle Bridge Road bridge before it was taken down, track circuit had already been largely used at King's Cross, in conjunction with an elaborate system of electrical repeaters, indicators, detectors, &c., and further track circuit developments have been entailed by the new work. Most of the platform lines were already track-circuited, and those of Nos. 6 and 10 have been extended to the buffer stops. A number of locking bars have been dispensed with wherever the installation of track circuit permitted of electrical locking of points. To accommodate the various track relays, a special relay house has been erected adjacent to the West box, thus giving great convenience for attention. The point detection concerned is accomplished electrically, the point detectors being provided by the Westing-

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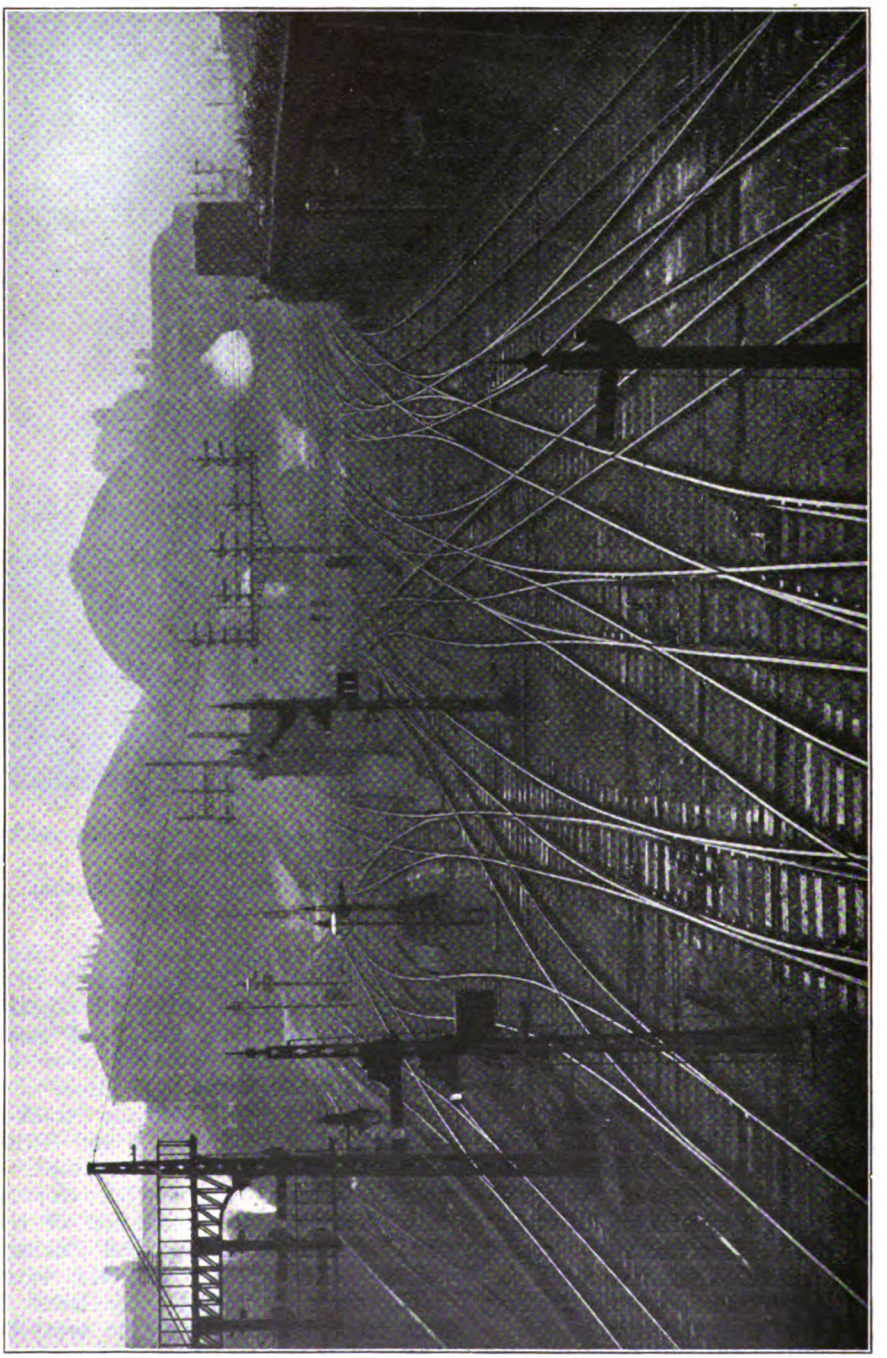

GENERAL VIEW OF APPROACH LINES, KING'S CROSS.

Upper Quadrant Route-Indicating Signals in foreground. Retaining wall and site of improvements to right.

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house Brake and Saxby Signal Company, Limited.

It will thus be seen that by a relatively small amount of new plant, and without undue expense, the suburban traffic capacity of King's Cross station has very materially been increased, and there are incidental gains, in that trains and engines of arriving trains can be sent off again more quickly than hitherto. At the same time, all the shunting and empty train or light engine facilities are retained, and the installation as a whole includes features which will no doubt give a lead to signalling and traffic officers elsewhere, and thus further progress in "scientific railroading" very materially.

Other developments in traffic volume and character at King's Cross, including the introduction of the 4-6-2 type of locomotive for main line express traffic, have rendered it necessary to undertake various important alterations and additions at King's Cross, to which reference may also be made at his stage. By courtesy of Mr. C. J. Brown, C.B.E., Chief Engineer, plans are reproduced, together with interesting photographs marked to indicate the location of the works now in progress.

To turn to the "Pacific" engines, a turntable 70 ft. in diameter is requisite; those in King's Cross locomotive yard and at King's Cross locomotive depôt are 50 ft. It is, therefore, at present necessary for the 4-6-2 engines to run light between King's Cross and Hornsey, where there is a 70 ft. turntable, in order to turn. This means light running for 8 miles between the up and down journeys on each London train worked by these big engines. This necessity might not be so serious in itself, but other factors are also involved, such as the occupation and wear and tear of the lines between King's Cross and Hornsey, the increased time that must be allowed between the arrival of the up train and the departure of the down one for which the engines are diagrammed, &c.

It has, therefore, been decided to erect a 70 ft. turntable at King's Cross on land on which, until a few years ago, stood part of the works of the Gas Light and Coke Company. The new turntable, engine sidings, &c., will be on the west side of the line, between King's Cross suburban station and the south end of the western gas works tunnel, as shown on one of the plans.

For some few years past alterations have been contemplated and in progress here. For this purpose, the late Great Northern Railway some years ago acquired some 5¾ acres of land from the Gas Light and Coke Company. Powers were also obtained for the removal of the bridge carrying Battle Bridge Road across the railway, just north of the terminus, together with a parallel bridge carrying an approach road to the gasworks This latter roadway was called by the railway "Congreve Street," but in our recollection, extending over nearly 40 years, of this entrance to the gasworks (the sole use of the bridge), has never been known by a name.

To enable Battle Bridge Road bridge to be closed it was necessary for the railway to substitute another thoroughfare between York Road and Pancras Road. For this purpose a new roadway has been constructed just south of the Regents Canal, and named Goods Way. This also provides a new and much more convenient entrance to King's Cross Goods Yard, by means of a new bridge across the canal, out of Goods Way.

This forms a far better approach to King's Cross goods depôt, as it avoids the steep ascent over the canal bridge in York Road to the old entrance to the goods yard on the north side of the canal. Trace horses were provided by the Great Northern Railway for attaching to the heavily laden horse-hauled goods vans to assist them up this incline. The trace horses were stabled in a small building at the south corner of Congreve Street, the north corner being occupied by a building, formerly a public house, which, however, had not been used for this purpose during our recollection of the locality. Immediately to the north of the public house on the York Road frontage the Gas Light and Coke Company erected a big building in record time some 35 years ago. There was then talk of a big strike of gasworkers, and the gas company erected this building for sleeping quarters for the men employed in the gasworks. so that they should not have to go outside the works and be at

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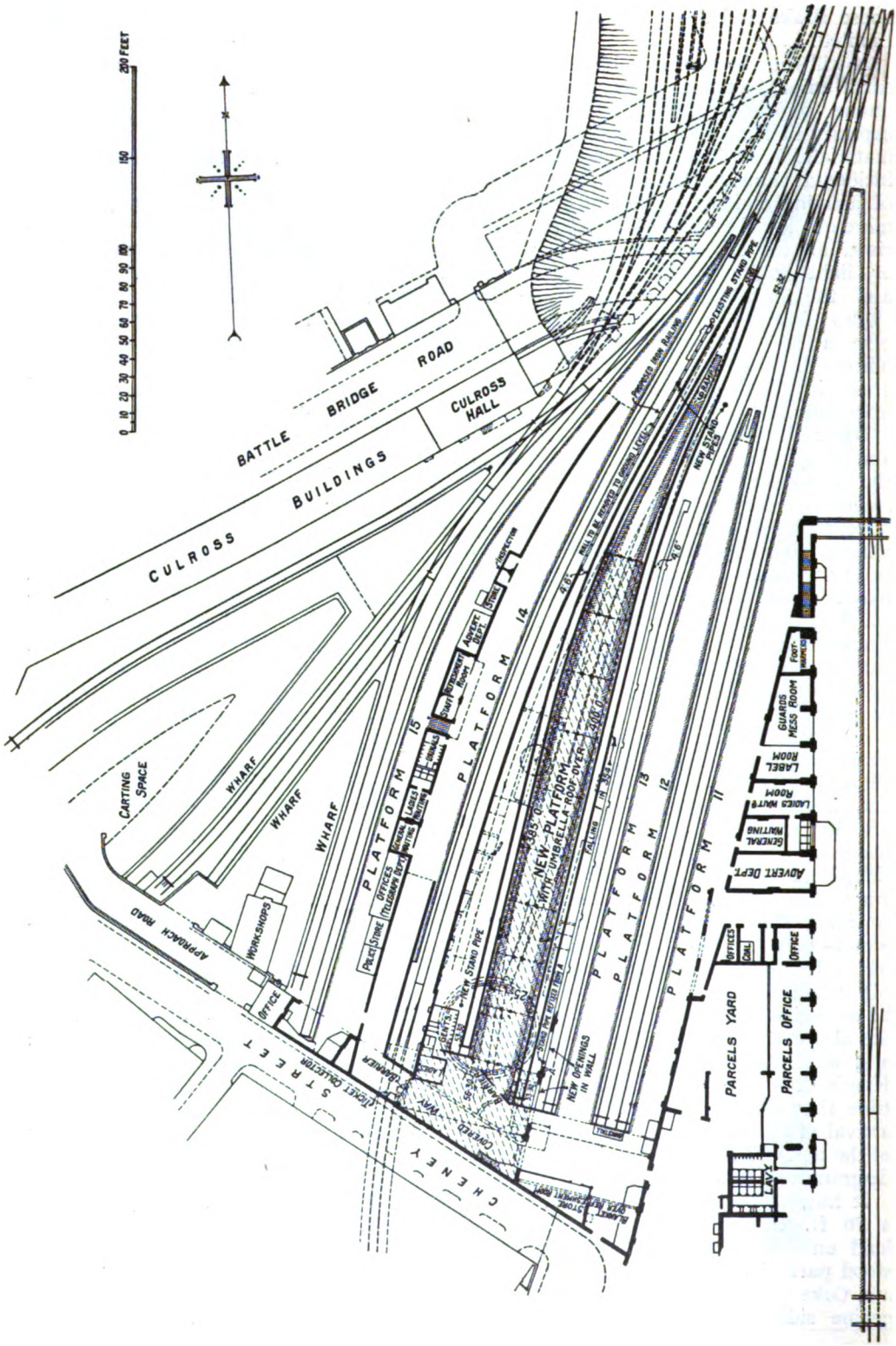

PLAN OF SUBURBAN STATION, KING'S CROSS, SHOWING NEW PLATFORMS ON SITE OF TURNTABLE AND ENGINE SIDINGS.

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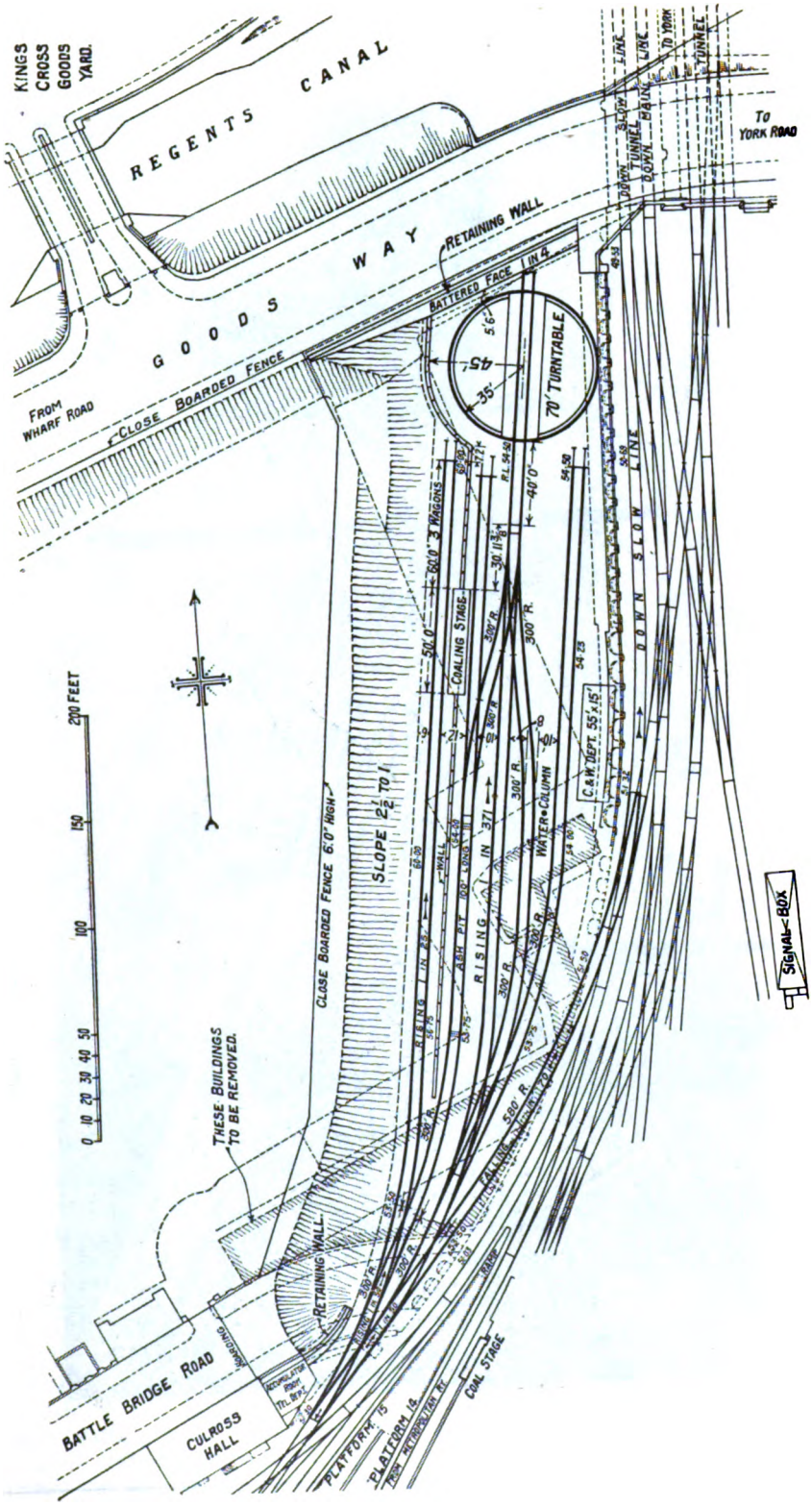

PLAN OF NEW ENGINE SIDINGS AND 70-FT. TURNTABLE. WORK NOW IN PROGRESS.

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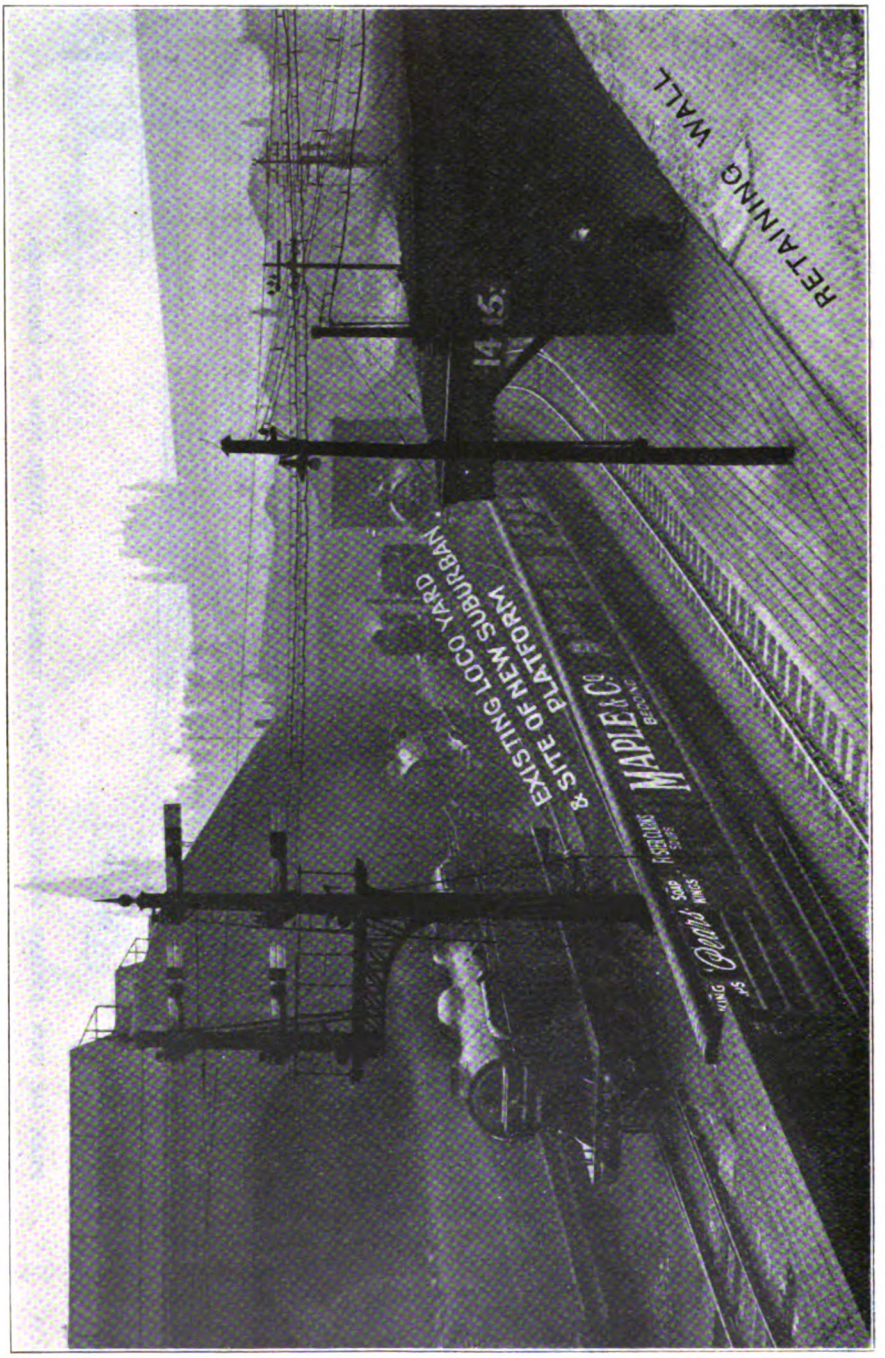

VIEW OF PRESENT ENGINE SIDINGS AND SUBURBAN STATION.

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the mercy of pickets. The strike after all did not take place, and the premises were never used until the Great Northern Railway acquired them, when about ten years ago the Publicity Department was transferred to the building.

To construct the new turntable, engine sidings, &c., it will be necessary to take down the existing retaining wall on the western side of the line, and to excavate the ground behind it to a depth varying between 15 ft. and 27 ft. The portion to be excavated for the present scheme amounts to one acre and a-half, involving the removal of some 23,000 cubic yards of material, consisting mainly of London clay, together with the foundations of the old gasworks. The retaining wall is of the recessed type and was built in 1892, when an additional tunnel was put in on the down side of the line. It consists of brickwork and concrete, and it is estimated that its demolition will involve the removal of 2,500 cubic yards of material from the site.

The present locomotive turntable and roads at King's Cross terminus are situated in the triangular space, the major sides of which are the main line local station on the east and the suburban station on the west. The base of this triangle is only sufficiently broad to accommodate and give the necessary clearance to the 50 ft. turntable now located there. Had there been more room the new 70 ft. turntable probably would have been erected on the site of the existing turntable.

Advantage will be taken of the removal of the locomotive yard to the new site, to provide additional accommodation for local passenger trains at King's Cross. Reference to the plan on page 218 will show that an additional terminal platform accommodating a train on each side is to be erected on the west side of platform 13. This platform is to be 400 ft. long and covered by an umbrella roof. It will be outside the boundary wall of the present local station, but access to the circulating area at the dead end is to be provided by openings in the existing wall, as well as from the present covered approach to the suburban station. The present waiting room, lavatories, &c., at the local station, on ground which will become the circulating area of the new platform, will be removed and new accommodation provided as shown on the plan.

It is 30 years ago since the local station at King's Cross was enlarged, and the suburban station reconstructed. Previously the local station only accommodated two trains, there being but a single road between platforms 11 and 12 on plan. This single road, therefore, had a platform on each side. What are now platforms 12 and 13 were much narrower, but there was, as now, a platform line on each side. At the time it appeared as if the small additional accommodation for one train only was scarcely worth the expense incurred, but the necessity for retaining the locomotive yard on the site prevented a bigger development. This enlargement of the local station in 1892–3 was only possible because the Great Northern Railway had acquired additional property on the west side of the suburban station. This enabled it to be reconstructed and the then extremely sharp curve flattened, so providing more space between the line from the Metropolitan Railway and the locomotive yard, which was shifted several feet westward, thus setting free space on the east side for the addition to the local station.

The flattening of the curve of the Metropolitan line eased considerably the train working in bad weather; the gradient is severe and there was always the possibility of trains being unable to start after stopping at the platform. The goods trains gave more anxiety; they were not accepted from King's Cross (Metropolitan) station until the line was clear through the suburban station, but there was always the possibility of necessity arising for trains to be stopped before fouling the lines from the terminus. In those days there was only one down line through Gas Works tunnel. A signal, repeating the starting signal, was provided at the tunnel mouth at the south end of the suburban platform, but the steam from the tunnel generally obscured it. The curve was too severe to enable the starting signal to be sighted when a train emerged from the tunnel. As an additional precaution, after dark, an inspector with a lamp stood at the south end of the platform and hand-signalled the trains as they emerged from the tunnel.

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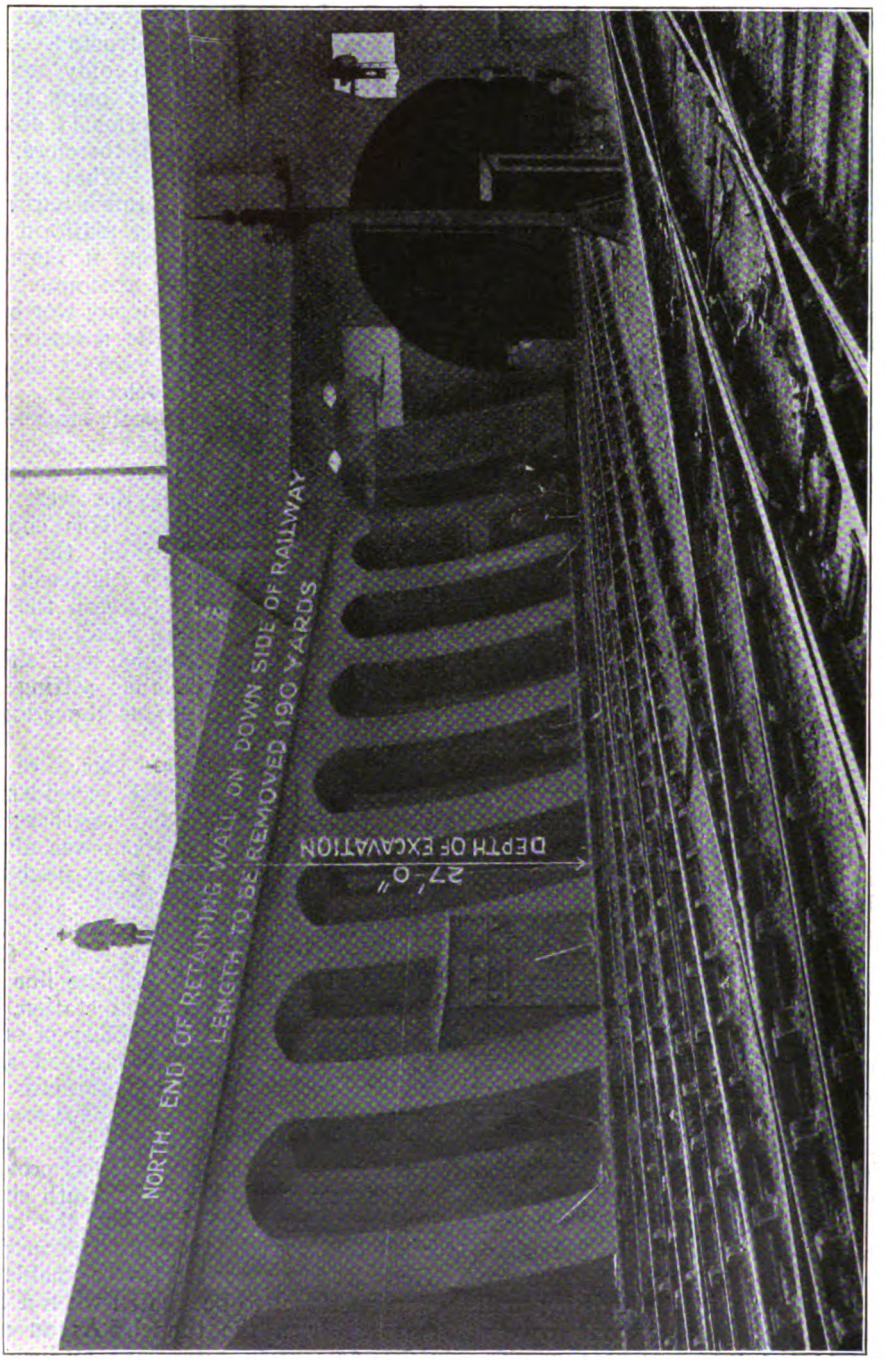

VIEW OF RETAINING WALL WHICH IS BEING DEMOLISHED TO MAKE ROOM FOR NEW ENGINE SIDINGS.

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The contract for the work of constructing the engine yard has been let to Symington, Sons & Co., of Glasgow. It includes, in addition to the details given above, the erection of a heavy retaining wall abutting on Goods Way and facing the new yard at its northern extremity, and a short length of wall at the site of the old Battle Bridge Road.

In connection with the foregoing remarks, we may call to mind the curious legal question that arose several years ago, when the Great Northern Railway sought to acquire from the Gas Light and Coke Company, the land on which the new engine lines, turntable, &c., are to be constructed.

When the Great Northern Railway was sanctioned, it acquired this land under the compulsory powers authorised by its Act. The land was afterwards sold under the surplus lands section of the Act to the Imperial Gas Company which was authorised to acquire it by its own private Act. The Imperial Gas Company afterwards became merged in the Gas Light and Coke Company. Several years after the Great Northern Railway had disposed of the land, they required it for extensions at King's Cross.

The question was then raised by the Gas Company as to whether having once acquired it under Parliamentary powers and disposed of it to another company, which acquired it under its own Parliamentary powers, the railway could again obtain powers to acquire the land compulsorily. The Great Northern Railway however, eventually again purchased the land, and are now making use of part of it, as already described.

AMERICAN RAILWAY STATION ARCHITECTURE.

Photo.] [*Norman Thompson.*

SOUTHERN PACIFIC RAILWAY DEPOT, SAN FRANCISCO.

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Rebuilt Four-cylinder Locomotive,

LONDON MIDLAND & SCOTTISH RAILWAY (GLASGOW & SOUTH WESTERN SECTION).

THE first four-cylinder locomotive to be placed in service on railways in the British Isles was constructed at the Kilmarnock Works of the Glasgow and South Western Railway about 26 years ago, to the designs of Mr. James Manson, at that time the Locomotive Superintendent. The engine was placed in traffic in April, 1897, and considerable interest attached to its appearance, mainly on account of its cylinder arrangement. As originally built, as No. 11, it had two cylinders inside, each 14½ in. diam. by 26 in stroke, and two outside, each 12½ in. diam. by 24 in. stroke. The boiler, in common with general practice at that time, supplied saturated steam to the cylinders. Total heating surface was 1,173 sq. ft., to which the tubes contributed 1,062 sq. ft. and the firebox 111 sq. ft., and a grate area of 18 sq. ft. was provided, a working pressure of 165 lb. per sq. in. being carried. The small size of the boiler in conjunction with the use of four high-pressure cylinders, was remarked upon in various quarters at the time the engine was introduced, and in the light of subsequent developments, where four-cylinder locomotives are concerned, it might be considered entirely inadequate. At that period, however, the large boilers of to-day were not considered necessary, or even practicable, a leading factor of modern design being, in the case of heavy main line locomotives, the provision of as large a boiler as can be mounted upon the frames.

By the courtesy of Mr. R. H. Whitelegg, Mechanical Engineer (Kilmarnock), London Midland and Scottish Railway, we are enabled to reproduce a photograph of the engine as originally built, and as frontispiece a view as it has recently been turned out from the Kilmarnock Works after rebuilding. The striking appearance of the locomotive after conversion can be gathered from a comparison of the two illustrations.

The boiler now fitted is of large size and well arranged to give maximum capacity. The engine as rebuilt has four cylinders, 14 in. diam., the outside pair having a stroke of 24 in. and the inside pair one of 26 in. The boiler is equipped with a superheater of the "Robinson" type, having 22 elements, the total heating surface being 1,803 sq. ft., and the grate area 27·6 sq. ft. The heating surfaces are distributed as follows :—

	Sq. ft.
Large tubes	357·41
Small tubes	1,086·59
Elements	211.00
Firebox	148·00

A working pressure of 180 lb. per sq. in. is carried. In its altered form the engine, exclusive of tender, weighs 61 tons 9 cwt., as against 48 tons 14 cwt. in the earlier design. The inside cylinders are formed in one casting, the outside pair being separate. Cross ports are introduced, thus making it possible for one piston valve to control the steam to both cylinders at one side. The front piston valve head serves the front port of the inside cylinder and also the back port of the outside cylinders, and *vice versa*, and by this means the rocking shaft with valve, valve spindle and valve connecting rod of the earlier locomotive are eliminated. The outside cylinders are identical in every respect, thus obviating the necessity for right and left-hand patterns. The piston valves have a diameter of 10 in. They were supplied by Allen & Simmonds, of Reading, in accordance with their patented design. The valves are arranged for inside admission and are actuated by Stephenson link motion as in the earlier type. Reversing is effected by means of steam reversing gear fixed to the right-hand frame close to the reversing shaft, and operated from the footplate, the cut-off in full gear being 77 per cent.

The reconstructed engine is, as seen, provided with a large and comfortable cab

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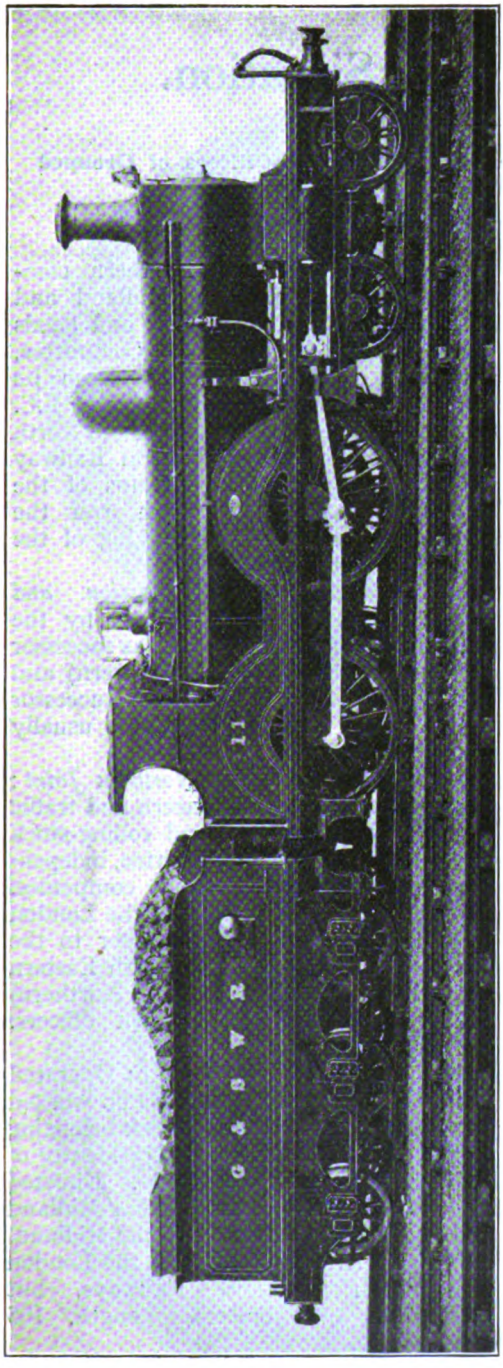

FOUR-CYLINDER 4-4-0 ENGINE AS ORIGINALLY BUILT IN 1897.

of the standard type now adopted on the Glasgow and South Western section of the London Midland and Scottish Railway. The tender, which is of the self-trimming or hopper type, has a water capacity of 3,260 gallons, and coal capacity of 5 tons, whereas the original engine had a water capacity of only 2,500 tons and carried 4 tons of coal.

In the original engine the rigid wheelbase was 8 ft. 9 in. This has been lengthened to 10 ft. in the reconstructed one, the total wheelbase, engine and tender being now 45 ft. 9⅞ in., as compared with 42 ft. 6½ in. In its original form the engine weighed in working order, without tender, 48 tons 14 cwt., the weight being now increased to 61 tons 9 cwt. Similarly, the tender, which weighed 32 tons 5 cwt., now turns the scale at 37 tons 7 cwt. The diameter of the wheels remains as before, namely, 6 ft. 9½ in., for the coupled wheels, and 3 ft. 7½ in. for the bogie wheels. The bogie wheelbase has been increased from 6 ft. to 6 ft. 6 in. The engine as originally constructed developed a tractive effort of 15,832 lb. In its altered condition it develops 18,390 lb. at 85 per cent. of the boiler pressure.

This is one of those cases in which a locomotive, though having become obsolete where first-grade main line traffic is concerned, still offered a sufficient opportunity for conversion. As now running, it is practically a new engine of a very much more modern and powerful description than before, and its greatly improved boiler and other characteristics should rank it among the most efficient 4-4-0 passenger locomotives in the country. Although the engine has been engaged in fast passenger traffic for a very short period it has, we are informed, already shown remarkable features of power output, acceleration and steady running at high speeds.

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The New Railway Situation.

Railways which are not Grouped. Further appointments of Officers of Grouped Railways.

LAST month the inauguration of the grouped railways was considered in detail, and evidence is to hand indicating that the concise presentment then given of the essential facts concerning the new railway situation was welcomed by a large proportion of our readers, in the business world as well as among those whose interest in railways is of a more general character. A number of further developments have since occurred and additional appointments have been announced, calling for continued consideration in this issue of the RAILWAY MAGAZINE. Before dealing, however, with these aspects, a short review is given of the railways which are not covered by the grouping requirements of the Railways Act of 1921. These lines, which are more numerous than is, apparently, generally realised, may be considered under classification headings. In all cases only railways are included which are organised on an independent basis, and which operate their own lines, usually providing locomotives and rolling-stock also.

I.—INDEPENDENTLY OPERATED JOINT RAILWAYS (BRITISH) IN WHICH GROUP COMPANIES ONLY ARE CONCERNED.

(1) *East London*: Jointly leased by London and North Eastern (as successor to the Great Eastern Railway), Southern (as successor to the London, Brighton and South Coast, South Eastern and London, Chatham and Dover Railways), Metropolitan and Metropolitan District Railways. Length, 5 miles. Managed on behalf of the lessees by the Metropolitan Railway, and passenger traffic operated electrically by trains of that company. Goods traffic worked by London and North Eastern Railway.

(2) *Cheshire Lines Committee*: Operated under the direction of a board of directors appointed by the London and North Eastern Railway (as successor to the Great Central and Great Northern companies) and the London Midland and Scottish Railway. Passenger and goods rolling-stock is owned by the Committee, and lines, etc., are maintained on its behalf. Locomotive power for C.L.C. trains is supplied by the London and North Eastern Railway (Great Central Railway section), but engines and trains of the owning companies also work over the system and share in the working of the traffic. Length is 142 miles.

(3) *Manchester, South Junction and Altrincham*: Trains are worked by the London Midland and Scottish (as successor to the London and North Western) and London and North Eastern (as successor to the Great Central) Railways, usually in alternate periods.

(4) *Midland and Great Northern Joint*: Operated as a separate concern and traffic worked by locomotives and rolling-stock belonging to the Joint Committee, independently of those of the owning companies. Directed by representatives of the London Midland and Scottish (as successor to the Midland) and London and North Eastern (as successor to the Great Northern) Railways, but having its own officers. Length, 183¼ miles.

(5) *Somerset and Dorset Joint*: Operated as a separate concern and traffic worked by locomotives and rolling-stock belonging to the Joint Committee, independently of those of the owning companies. Directed by representatives of the London Midland and Scottish (as successor to the Midland) and Southern (as successor to the London and South Western) Railways, but having its own officers. Length, 105 miles.

II.—BRITISH RAILWAYS NOT INCLUDED IN GROUP COMPANIES.

(a) Electric or Electric and Steam Lines.

(6) *Central London*: Associated with the Underground Electric Railways Company of London, Limited. Length, 7

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Photo.] **MR. G. HUGHES, C.B.E.,** [*N. S. Kay.*
Chief Mechanical and Electrical Engineer,
London Midland and Scottish Railway.

Elliot] **SIR HENRY FOWLER, K.B.E.,** [*& Fry.*
Deputy Chief Mechanical Engineer,
London Midland and Scottish Railway.

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miles. Trains work through to Ealing over the Ealing and Shepherd's Bush Railway (Great Western Railway).

(7) *City and South London*: Associated with the Underground Electric Railways Company of London, Limited. Length, 7¼ miles.

(8) *London Electric*: Associated with the Underground Electric Railways Company of London, Limited. Length, 24 miles.

(9) *Liverpool Overhead*: Length, 6½ miles.

(10) *Mersey*: Length, 4¾ miles.

(11) *Metropolitan*: Steam and electric; length, 65¾ miles.

(12) *Metropolitan District*: Associated with the Underground Electric Railways Company of London, Limited. Length, 27¾ miles.

(b) Light and Similar Railways (standard gauge).

(13) *Bideford, Westward Ho! and Appledore*: Length, 7 miles. At present closed.

(14) *Bishops Castle*: Length, 9¾ miles.

(15) *Corringham Light*: Length, 2¾ miles.

(16) *Derwent Valley*: Length, 16 miles.

(17) *Easingwold*: Length, 2½ miles.

(18) *East Kent*: Length, 48 miles.

(19) *Glasgow (Cable) Subway*: Length, 6¾ miles.

(20) *Hundred of Manhood and Selsey Tramways*: Length, 8 miles.

(21) *Jersey Eastern*: Length, 6¼ miles.

(22) *Kent and East Sussex*: Length, 24 miles.

(23) *Mumbles*: Length, 5½ miles.

(24) *Nidd Valley Light*: Length, 6 miles public, 7 miles private.

(25) *North Sunderland Light*: Length, 4 miles.

(26) *Rowrah and Kelton Fell*: Length, 3 miles.

(27) *Shropshire and Montgomeryshire*: Length, 26 miles.

(28) *Stocksbridge*: Length, 2 miles.

(29) *Swansea Improvements and Tramways Company*: Length, 18 miles.

(30) *Wantage Tramway*: Length, 2½ miles.

(31) *Weston, Clevedon and Portishead*: Length, 14½ miles.

(c) Light Railways other than Standard Gauge.

(32) *Brighton Electric*: 2 ft. 8½ in. gauge; length, 1¾ miles. A beach pleasure railway.

(33) *Camborne and Redruth Tramway*: 3 ft. 6 in. gauge; length, 3¼ miles. Partly of tramway character.

(34) *Campbeltown and Macrihanish*: 2 ft. 3 in. gauge; length, 6 miles.

(35) *Corris*: 2 ft. 3 in. gauge; length, 11 miles.

(36) *Eskdale*: 15 in. gauge; length, 7¼ miles.

(37) *Festiniog*: 1 ft. 11½ in. gauge; length, 14½ miles.

(38) *Glyn Valley*: 2 ft. 4½ in. gauge; length, 8¾ miles.

(39) *Isle of Man*: 3 ft. gauge; length, 46¼ miles.

(40) *Jersey Railways and Tramways*: 3 ft. 6 in. gauge; length, 7½ miles.

(41) *Manx Electric*: 3 ft. gauge; length, 18 miles; 3 ft. 6 in. gauge; length, 5 miles.

(42) *North Wales Narrow Gauge*: 1 ft. 11½ in. gauge; length, 12¼ miles.

(43) *Portmadoc, Beddgelert and South Snowdon*: 1 ft. 11½ in. gauge; length, 4¾ miles.

(44) *Rye and Camber*: 3 ft. gauge; length, 3 miles.

(45) *Snailbeach District*: 2 ft. 4 in. gauge; length, 3¼ miles.

(46) *Snowdon Mountain Tramroad*: 2 ft. 7½ in. gauge; length 5 miles. Rack railway.

(47) *Southwold*: 3ft. gauge; length, 9 miles.

(48) *Tal-y-llyn*: 2 ft. 3 in. gauge; length, 6¾ miles.

(49) *Wolverton and Stoney Stratford*: 3 ft. 6 in. gauge. Owned by L.M. & S.R.

(d) Miscellaneous.

(50) *Felixstowe Docks and Railway*: Length, ½ mile.

(51) *Manchester Ship Canal*: Length (railways), 156 miles.

(52) *Mersey Docks and Harbour Board*: Length (railways), 104 miles.

(53) *Milford Haven Dock and Railway*: Length, 1¼ miles.

(54) *Pentewan Railway, Port and Trading Company*: 2 ft. 6 in. gauge; length, 4 miles. Temporarily closed.

(55) *Trafford Park*: Length, 18 miles.

There are, of course, the various Irish railways, for which no grouping scheme has yet been introduced, though proposals to that end have been made. British railway companies are, however, interested in regard to certain lines (see page 232).

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SIR VINCENT RAVEN, K.B.E.,
Technical Adviser,
London and North Eastern Railway.

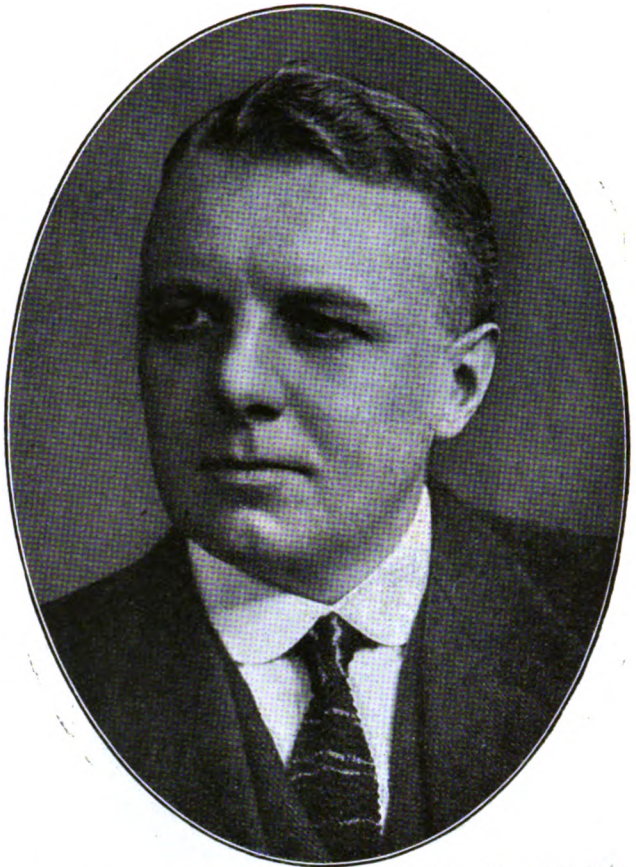

Photo.] **MR. R. W. REID, C.B.E.,** [*Vandyk, Ltd.*
Carriage and Wagon Superintendent,
London Midland and Scottish Railway.

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MR. J. E. ANDERSON, C.B.E.,
Superintendent of Motive Power,
London Midland and Scottish Railway.

MR. F. W. DINGLEY,
Superintendent of Motive Power
(Old L. & N.W.R.),
London Midland and Scottish Railway.

MR. H. E. O'BRIEN,
Electrical Engineer,
London Midland and Scottish Railway.

MR. H. P. M. BEAMES,
Mechanical Engineer
(Crewe),
London Midland & Scottish Railway.

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MR. G. N. SHAWCROSS.
Mechanical Engineer
(Horwich),
London Midland and Scottish Railway.

Elliott] [*& Fry.*

MR. J. A. HOOKHAM,
Mechanical Engineer
(Stoke-on-Trent),
London Midland and Scottish Railway.

Photo.] [*Annam & Sons.*

MR. W. PICKERSGILL, C.B.E.,
Mechanical Engineer
(St. Rollox, Glasgow),
London Midland and Scottish Railway.

MR. R. H. WHITELEGG,
Mechanical Engineer (Kilmarnock),
London Midland and Scottish Railway.
(*Appointed General Manager and Engineer-in-Chief, Beyer, Peacock & Co., Ltd.*)

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(*a*) *County Donegal Joint Committee*: Jointly owned, but operated with its own locomotives, rolling-stock and staff, by the London Midland and Scottish (as successor to the Midland) and Great Northern of Ireland Railways. Length, 111 miles; 3 ft. gauge.

(*b*) *Dundalk, Newry and Greenore*: Owned by London Midland and Scottish (as successor to London and North Western) Railway. Length, 26½ miles.

(*c*) *Northern Counties Committee*: Owned but operated with its own locomotives, rolling-stock and staff, by the London Midland and Scottish (as successor to the Midland) Railway. Length, 265¼ miles.

There are 13 other 5 ft. 3 in. gauge systems, 12 of 3 ft. gauge, and the Listowel and Ballybunion "mono-rail" line, in addition to those given above. The Fishguard and Rosslare Railways and Harbours may also be mentioned, the Great Western of England and Great Southern and Western of Ireland being both directly interested therein.

Lynton & Barnstaple Railway: This line was taken over by the London & South Western Railway during 1922, though the arrangement was not provided for by the Railways Act of 1921. It is 19¼ miles in length, and of 2 ft. gauge. The company was inaugurated 27th June, 1895, and the line opened for traffic, 16th May, 1898. Four specially constructed locomotives are used, and there are 17 coaching vehicles and 24 freight vehicles.

Not a great deal has occurred since the February number was published in connection with new appointments associated with the grouping of railways, but a few developments require to be covered. On January 15 the Railways Amalgamation Tribunal provisionally approved the absorption by the Southern Railway, through the South Eastern and London, Chatham and Dover Companies, of the London and Greenwich, Mid Kent (Bromley to St. Mary Cray), and Victoria Station and Pimlico Railways. Next day the Tribunal approved the absorption by the Great Western Railway Company of the Gwendreath Valleys, Liskeard and Looe, Llanelly and Mynydd Mawr, Mawddwy, Penarth Extension, South Wales Mineral, Teign Valley, Van, and Welshpool and Llanfair Light Railways. A few days later particulars were announced as to provisional agreements for the absorption by the London Midland and Scottish Railway of the Callander and Oban and Solway Junction Railways. On January 29, particulars were issued as to the terms for the absorption by the London and North Eastern Railway of the Sheffield District Railway, and by the London Midland and Scottish Railway of the Stratford-upon-Avon and Midland Junction Railway.

Several important appointments in regard to the London and North Eastern Railway must now be referred to as follows:—

Sir Vincent L. Raven, K.B.E., formerly Chief Mechanical Engineer of the North Eastern Railway Company, to be Technical Adviser to the Company.

Accountant's Department.

Mr. A. E. Williams, Accountant, North Eastern Railway, to be Deputy Accountant.

Mr. C. H. Newton, Great Eastern Railway, to be Assistant Accountant.

Mr. J. Proctor-Smith, Great Northern Railway, to be Divisional Accountant, London.

Mr. Paul Gibb, North Eastern Railway, to be Divisional Accountant, Newcastle.

Mr. S. Rowbottom, Great Central Railway, to be Assistant Divisional Accountant, Manchester.

Mr. R. Brown, North British Railway, to be Divisional Accountant, Edinburgh.

Goods Department.

Mr. G. Marshall, Great Northern Railway to be Goods Manager, Southern Area, with headquarters at Liverpool Street.

Mr. Thos. Hornsby, North Eastern Railway, to be Goods Manager, North Eastern Area.

Engineering Department.

Mr. C. J. Brown, Great Northern Railway, to be Engineer, Southern Area (G.C. and G.N. Sections).

Estate and Rating Department.

Mr. A. J. Brickwell, Great Northern Railway, to be Estate and Rating Agent, Southern Area (G.E. and G.N. Sections).

Mr. J. Oldham, Great Central Railway, to take over the Rating work of the

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MR. ASHTON DAVIES, M.B.E.
General Superintendent
(Western Division),
London Midland and Scottish Railway

Elliott] [*& Fry.*

MR. R. KILLIN, C.B.E.,
General Superintendent
(Midland Division),
London Midland and Scottish Railway.

Elliott] [*& Fry.*

MR. J. BALLANTYNE, O.B.E.,
General Superintendent
(Northern Division),
London Midland and Scottish Railway.

MR. C. R. BYROM, O.B.E.,
General Superintendent
(Passenger Commercial),
London Midland and Scottish Railway.

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North Eastern Area in addition to his present duties.

Chief General Manager's Office.

Mr. A. Oldham, G.C.R., to be Assistant to the Chief General Manager with charge of Parliamentary and Works matters.

Mr. W. M. Teasdale, N.E.R., to be Advertising Manager, with headquarters in London.

Superintendent's Department.

Mr. J. Lees, G.C.R., to be Assistant Superintendent, Southern Area (G.C. Section).

Three further appointments were also announced in regard to the Southern Railway as follows :—

Mr. Henry William Witt to be Registrar (temporarily) with his office at the Brighton Railway Station, London Bridge.

Mr. Charles John Francis to be Stores Superintendent, and Mr. Alfred Pryce Innocent to be Deputy Stores Superintendent, with offices at Waterloo Station.

While dealing with the grouping system reference may be made to a special interview by the *Yorkshire Evening News* with Mr. R. L. Wedgwood, Chief General Manager, London and North Eastern Railway, in which several important aspects of grouping were discussed. Mr. Wedgwood pointed out that the man in the street hardly realised the real revolution in railway affairs which took place on January 1 this year. The Railways Act of 1921 called for the largest amalgamation of capital which had ever taken place in the whole of our commercial history. The financial standing of the companies forming the Eastern Group varied very greatly, yet, not only did they succeed in producing a complete scheme of amalgamation which was sanctioned by the shareholders of the various companies, but, pending a settlement of the financial arrangements the companies in the group had been working together ever since Government Control ceased on August 15, 1921. The experience thus gained was of very great value. It brought to light the various characteristics of the constituent companies. It enabled them to anticipate and prevent friction.

Thus, though on January 1 a new nominal company with 7,000 miles of line and £350,000,000 capital came into being, hardly any attention was needed to make it effective. Traders found that they had to deal with officials who were known to them, for the policy of the new company was to preserve that close personal touch between the trading community and officers of the railway which had worked to the satisfaction of both parties in the past.

While the head office would be in London they did not intend to govern the whole of the railway from London. In order to preserve something of the individuality of the old constituent companies, the control would be in the hands of two Divisional General Managers, who would be in charge of areas corresponding to the "Three Greats" and the North Eastern respectively, and of a General Manager for Scotland. The whole would then come under the general control of a Chief General Manager, in London. The need for this subdivision would be obvious, seeing that the total staff of the London & North Eastern Railway would be approximately 223,000.

There were great prospects before the new company. Its territory covered practically the whole of Eastern Britain from the Thames to the Moray Firth, in addition to extensive and important areas in the centre and west of England and Scotland. Of the 10,500,000 urban population of Great Britain, 80 per cent. was directly served by the London & North Eastern, which, in addition, served the large population of the north and east of London. It was the largest dock-owning railway company in the world, owning 38 docks, with 38 miles of quays and 800 acres of water area. It also controlled steamship services in direct connection with two-thirds of the Continent of Europe.

Forty per cent. of the total output of coal in Great Britain was raised from collieries directly served by the company. Over 50 per cent. of the pig iron made in Great Britain was produced within its territory. In the West Riding and Lancashire districts served by the railway there was an immense productive area both for woollens and textiles. Perhaps the greatest industry served by the company was shipbuilding. He looked to the future with a feeling of optimism. Rates and charges were still high, but were falling and would fall still further as trade revived.

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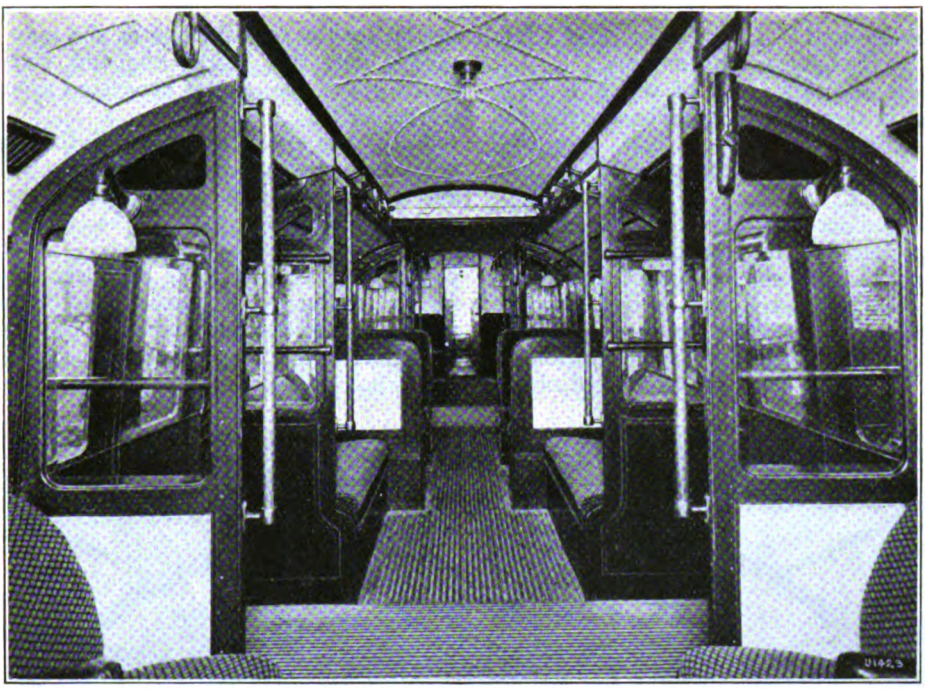

CAR No. 720.

Designed by "Underground" Engineering Staff. Built by the Gloucester Railway Carriage and Wagon Company, Limited.

Perfection in Tube Travel.

DEMONSTRATION CARS ON THE LONDON ELECTRIC RAILWAYS.

OWING to the lack of finality in invention it may be that no railway rolling-stock builder will ever be able to prove that he has produced a perfect vehicle, that is, a railway coach brought to such a consummation that no further improvement is possible, and one that may be pointed at with pride as the best and completest type without blemish or defect; in fact absolutely faultless. All the same it is by seeking perfection that improvement is achieved in the building of railway rolling-stock, as in all other mundane matters.

In pursuit of this elusive attribute, in regard to its rolling-stock, the London Underground Electric Railways some few months ago hit upon a novel plan. It was decided to invite a number of rolling-stock building firms of repute and experience to co-operate with the "Underground" officers in a real attempt to produce the "perfect" car for London tube working, and as a result five cars independently designed have been supplied by the following firms:—

(1) The Birmingham Carriage & Wagon Company, Limited, of Smethwick.
(2) Cammell Laird & Co. Ltd., of Nottingham.
(3) The Gloucester Railway Carriage and Wagon Company, Limited, of Gloucester.
(4) The Leeds Forge Company, Limited, of Leeds.
(5) The Metropolitan Carriage, Wagon and Finance Company, Limited, of Birmingham.

An additional car, as designed by the

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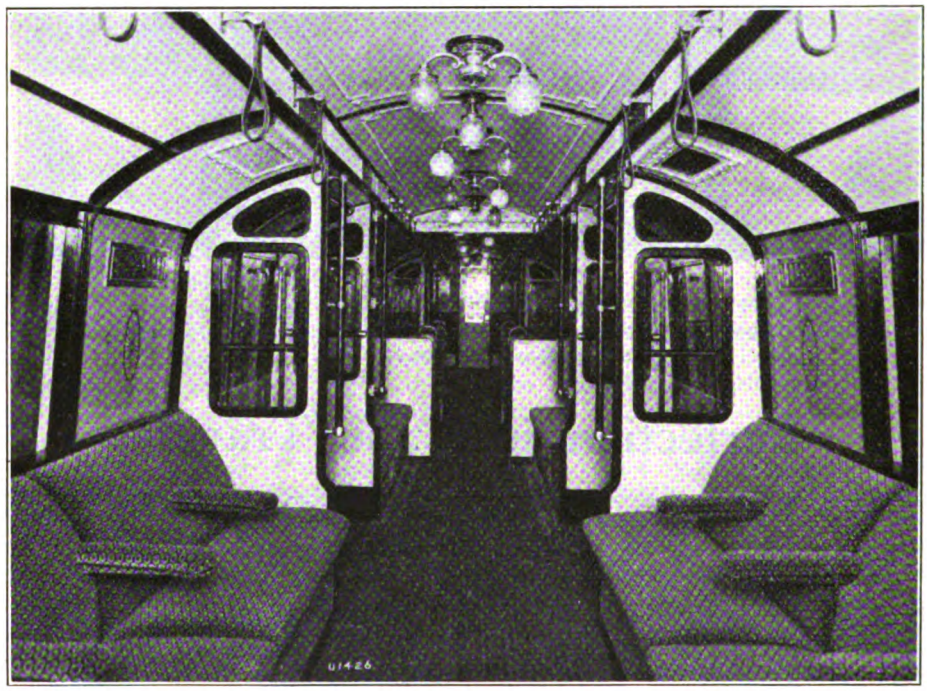
"Underground" Engineering Staff, was built by the Gloucester Company.

These six cars, each of which is illustrated in these pages, have been delivered in readiness for service and were the subjects of special trial runs on Saturday, February 3.

The builders were required to conform to specification in regard to controlling dimensions and such like essential features, but otherwise each had a free hand in designing, construction, equipment, lighting, ventilation and interior decoration.

As the result of much prolonged observation and experience, one of the principal reservations made by the railway people concerned the position and width of the doors to the vehicles. Continued experiments have demonstrated that the best system is the one which provides a pair of double doors spaced along either side of the car. With this arrangement the railway staff find the tube travelling public far more willing to obey the injunction "please pass down the car," as every seat is within easy reach of an exit and the passenger is relieved of the anxiety caused by the fear that he or she may be carried past the desired alighting station by reason of the crowds congested around the car exits.

Noise has ever been one of the least charming characteristics of tube travel and it is one that the authorities have felt could be abolished greatly to the advantage of the long-suffering passenger. In the past tube travellers have not been noted for the exchange of mutual confidences; intimate conversation required too great an effort while travelling underground. But what are such difficulties for, if not to be overcome? To this end a number of experiments have been undertaken by Dr. A. M. Low, and by means of photographs of the "sound" heard in an ordinary tube vehicle when in motion, it has been found possible to locate the principal causes of the clamour of the cars. This knowledge has been followed by exhaustive experiments and these in turn have had marked influence in the designs of the experimental cars. In each of the new vehicles the car bodies are of metal and the roofs, position and width



CAR No. 823.

Designed and built by the Birmingham Railway Carriage and Wagon Company, Limited.

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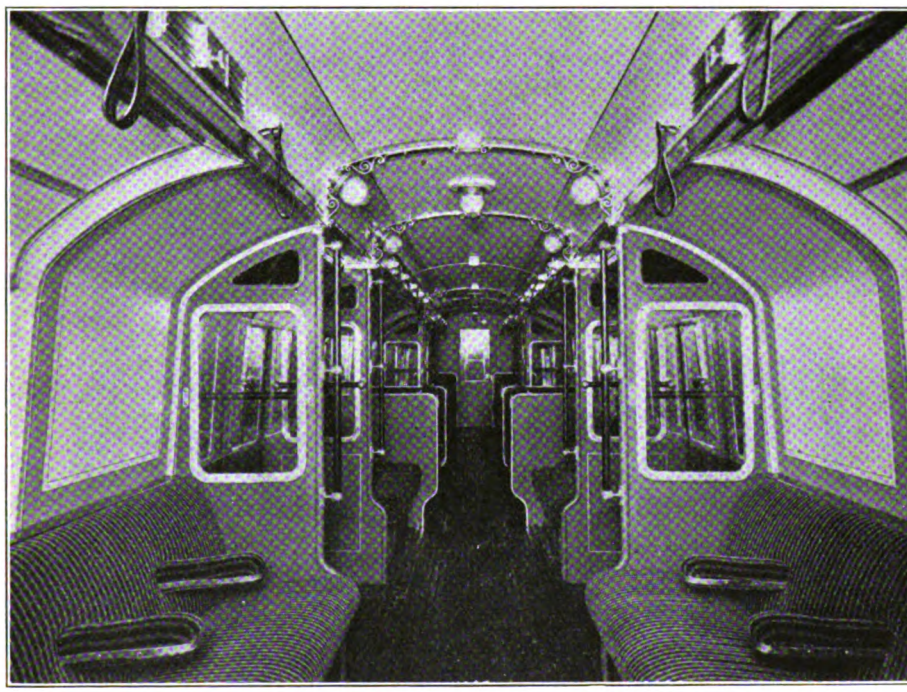
of doors, exterior painting, air-operated doors, overall dimensions and seating arrangements are similar, except that the "Underground" car is a "control trailer," and in it some modification of the seats has followed the necessity for providing a driver's compartment.

RAILWAY MAGAZINE readers who examine the interior views of the six cars, will notice distinct points of difference in the ideas of the respective designers in the details of the equipment. Certain features may make a stronger appeal than do others, but it cannot be disputed that each agreed that a fitting term would be "tube cars *de luxe*." The running, in spite of the fact that the vehicles were still more or less "stiff" with newness, was not only exceedingly comfortable over points and crossings and around curves, but it was comparatively noiseless. It was particularly noted that in the new cars there was no slamming of gates, and that the ventilation had been so designed that there existed no need to have windows open while travelling. Open windows have ever been one of the principal producers of noise when traversing the tubes.



CAR No. 824.

Designed and built by Messrs. Cammell Laird & Company, Limited.

one of them constitutes a notable advance upon any tube railway vehicles previously in service.

When on Saturday, February 3, demonstration journeys were made, two trains were run each consisting of three new vehicles, together with ordinary motor cars, as all the new stock consists of trailer vehicles. The privileged passengers were loud in commendation of the new stock. One visitor described the demonstration trains as "Underground Pullman Specials" while it was generally

A large number of new cars will be required when the Hendon and Edgware extension is finished, and the coming connections between the London Electric and City and South London lines are ready for through traffic. The experience gained with these new demonstration cars will be of vital assistance in coming to a decision as to the precise form the rolling-stock will take. Probably no one will be chosen in preference to the others, but that certain features of each will be incorporated in the ultimate design.

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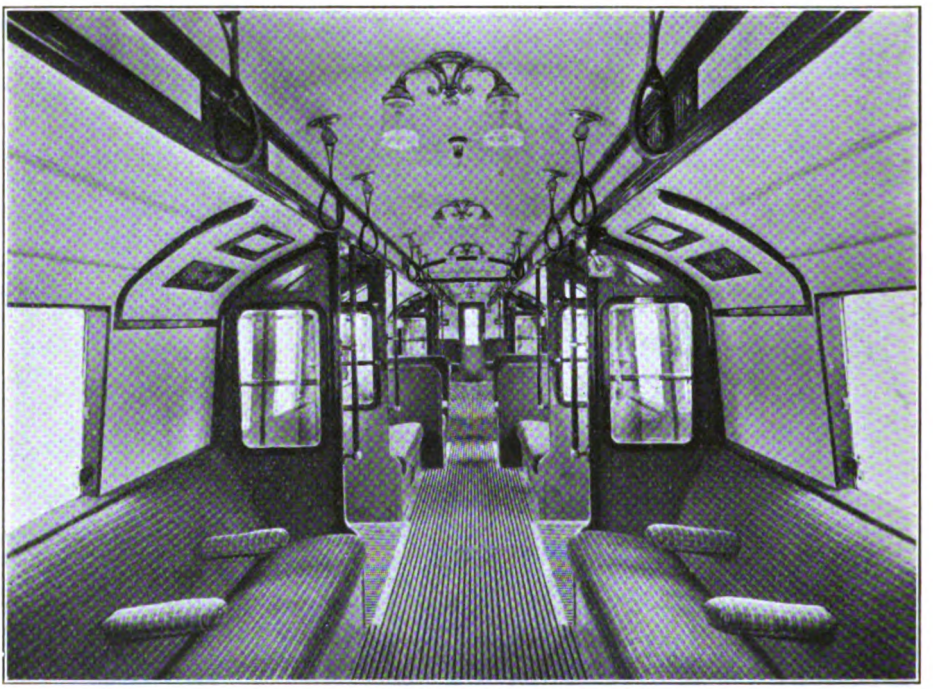
Among those present at the demonstration were Mr. Z. E. Knapp, Director of Construction, Mr. J. P. Thomas, Operating Manager; Mr. J. Thornton, Superintendent of the Line; Mr. A. R. Cooper, Chief Engineer; Mr. E. A. Cockshott, Technical Officer, Engineering Department (Construction and Power); Mr. W. A. Agnew, Mechanical Engineer; Mr. Ivor Fraser, Publicity Officer; Captain Rozier, and others.

The following are brief descriptions of the new vehicles, all of which seat 48 passengers, except that built to "Underground" designs, which is fitted as a control trailer car and seats 44 passengers only.



CAR No. 820.
Designed and built by the Gloucester Railway Carriage & Wagon Company, Limited.

CAR No. 823.—BIRMINGHAM RAILWAY CARRIAGE AND WAGON CO., LIMITED.

Body built of U-section pressed steel pillars and angle-section rails, securely framed together and panelled with cold rolled close annealed plates riveted to framing. Roof of clerestory type and consists of mild steel plates riveted to light angle carlines, the whole secured to cant rails. Frameless windows fitted with balancing device; drop, 6 in. Ventilation by series of air scoops fitted in roof, air passing into a channel formed by the clerestory rail and inside panel and controlled by ornamental grids inside car. Body of car sound insulated by sheet cork secured to inside panels, while roof has a double layer of insulating cork, one layer secured to roof plates and the other layer to top of ceiling panel. Floor of successive layers of slag wool, asbestos and cork, with wood slats above. Over bogies a further layer of asbestos insulation is secured. To overcome the "drum" effect caused by the longitudinal seats also forming wheel boxes, thick "Wadnit" sound insulation is used, secured to seat plates. Wheels are fitted with wood blocks between spokes to reduce the metallic ring when in motion. Seats of Woods' patent wire woven type. Interior decorated by polished mahogany mouldings, panels being painted French grey and further relieved on the end and door pocket panels by ornamental festoons. Ceiling panels are of Agasote, with "Adams" treatment in decoration and painted white. Underframe of light rolled sections and pressings. Bogie frames of mild steel plates, angles and pressings. Exterior in vermilion, black and cream, in accordance with specification, as in the case of other vehicles. All fittings have oxidised silver finish.

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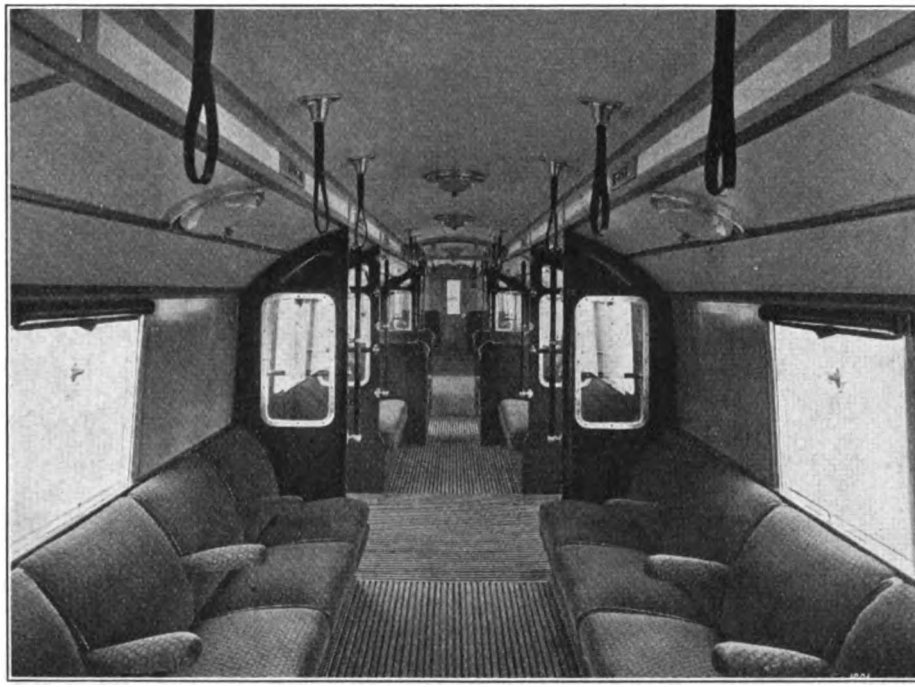
CAR No. 824.—CAMMELL LAIRD AND CO. LIMITED.

Only marketable materials used, but the advisability of using high tensile steel in future considered to further lighten structure. Three systems of springs between axle-boxes and car body; anti-vibration packings inserted between bolsters and bogie centre pivots. To obtain noiseless running all play in moving parts reduced, wearing surfaces of "Ferodo" introduced in brake gear and elsewhere. Floor consists of steel dovetail sheeting, with an upper layer of floor boards, the space between being filled with granulated cork composition. Sides and roof insulated with three-ply "Salamander" hair-felt between inside and outside linings. Canvas applied to inside panelling and seat plates to prevent "drumming." Each bogie shrouded in a leather covering reaching down to within a few inches of rail level. Structural work of lightest possible description consistent with strength. Unit principles in design adopted to avoid multiplicity of details and fittings. Aluminium used wherever practicable for construction and for interior fittings. Outside mouldings and joints avoided wherever possible. Framing and panelling of side doors entirely of aluminium.

Seats and seat-backs fitted with coil spring cushions. Ventilation includes balanced side sliding windows. Sliding glass panels in end doors, and louvre type ventilators in clerestory operated by a cam action. Outside ventilators of special type, combining intake and exhaust action whichever way car is moving. Doors have soft rubber flexible edges to give required resiliency and to obtain a weather joint, while at the same time preventing risk of injury should a passenger's hand or a portion of his clothing be trapped between the two doors when closing. To maintain the door tracks free from obstruction, a track cleaner is fitted to each side door.



CAR No. 821.
Designed and built by the Leeds Forge Company, Limited.

Diffused lighting is a feature of this car. The main lights are placed in troughs, housed inside the deck rails and glazed on the underside with semi-transparent glass mounted in hinged frames. These troughs are utilised as longitudinal roof members. Underframe embodies two strong central girders, which take up the principal draw and buffing shocks and form the load-carrying members, so that the side doorway openings do not cut into the main underframe members.

Interior decoration in blue with gold finish.

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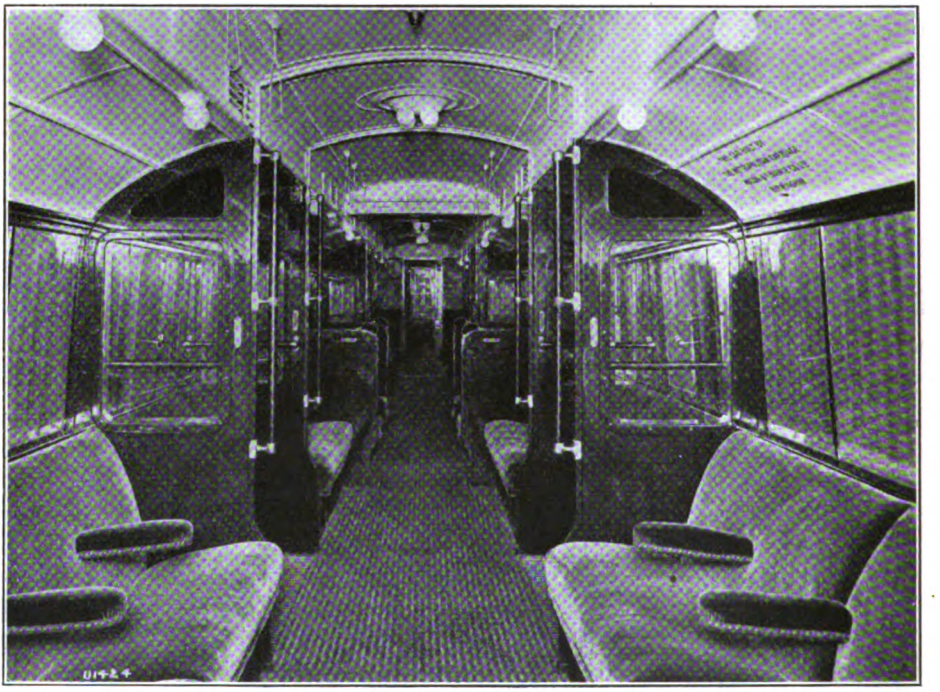
CAR. No. 820.—GLOUCESTER RAILWAY CARRIAGE AND WAGON CO., LIMITED.

Bogies of Gibbins' spring frame type, giving easy riding, as the load is taken direct on the springs from the main frame; the weight of the body is taken on roller side bearings and not on the centre pivot, thus eliminating side roll, while the fact that there is no clearance between axleboxes and bolster to be taken up, as on the ordinary bogie, gives smooth starting and stopping. Weight is also considerably reduced. Body insulated by "Wadnit" rammed between exterior and interior panels, the former being lined with canvas. Windows of frameless type, fitted with spring balances and arranged to fall 6 in. Twelve ventilators fitted in monitor, of pivotted vane type, exhausting the air automatically whichever direction the car travels. Seats of "Peters" type, covered in moquette. One cross-seat fitted with "Woods" woven wire seats for comparison. Double side doors of mahogany, sheathed with aluminium and operated by air motors. Doors fitted with rubber edges forming a flexible and watertight joint. Interior finish of "Agasote" panels. Hand grips of special type in polished mahogany, suspended from the roof. Colour scheme, light blue. Metallic fittings silver oxidised.

CAR No. 821.—LEEDS FORGE CO., LTD.

Bogie frames of pressed steel, giving ample strength without excessive weight. Bolster suspension designed to prevent excessive lateral movement on curves. Springing arranged to reduce unsprung weight, to obtain resilience without undue vertical movement, and to absorb rail shocks near the point of origin. Shrouding plates of steel, covered on the inner and outer surfaces with canvas, and with hinged side plates for examination. The end shrouding is sloped to deflect sound on to the road bed. Underframe, of pressed steel construction, is, so far as load carrying is concerned, incorporated as a unit with the body. In the buffing and drawgear "Ferodo" bushes have been used for the sector bar pins, also the platform plate plungers. Design of the body prepared with a view to ease and quickness of production. Sides, ends and roofs built in jigs as units to ensure complete interchangeability, all parts being also drilled to templates. Amount of welding is negligible. Construction is all-steel, aluminium or alloy only being used for doors, fittings and interior mouldings. Timber used only for floor slats, window capping, end door posts, windscreen parts, handrails and pateras, and on ends of seats. Sides are constructed with



CAR No. 822.

Designed and built by the Metropolitan Carriage, Wagon & Finance Company, Limited.

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pressed steel pillars, sheeted on outside with steel plates, there being no expensive window or other pressings. Horizontal mouldings, cantrails, cribrails, inside waist rails and door pocket members of rolled steel sections. Interior sides and ends of steel sheets secured to framing, also aluminium mouldings, by means of wood screws into fibre blocks. Ceiling of " Agasote," secured to roof framing in the same manner. Side sliding doors of one-piece aluminium castings, sheeted on both sides with aluminium plates. They have standard rollers at the bottom, with the exception that an eccentric pin is provided to lift or lower the doors when the very limited clearances allowable make it necessary. A " Crittall " runner is fitted, and is provided with springs which allow the door to ride over any obstruction, and also prevent rattle. A " Crittall " runner has also been fitted at the rear of the sliding door for connecting to the air motor arm. Sliding doors fitted on the closing sides with sponge rubber safety edges, moulded to fit one slightly into the other, and are of such soft nature as to provide, with the compression of the air motor springs, a complete watertight joint. They also allow caught clothing to be easily withdrawn when the doors are closed and the coach in motion. Windows provided with zinc water pockets, and a lifting gear made as one unit. Seats of Vi-Spring pattern, made by the Marshall Patent Mattress Company. Longitudinal seats constructed individually, to permit easy access to the door-operating gear, and for economy in repairs.

Ventilation by extraction. There are 28 extractor ventilators in all, 20 of which ventilate the interior of the car. The remaining eight ventilate the air space between the outer and inner walls of the body. Electric lamps enclosed in Holophane bowl fittings at the lower clerestory and the centre ceiling. Emergency lights fitted into two of the bowl fittings. Two bulbs extra are provided for an illuminated sign. Noise insulation includes canvas attached to the inside of outer sheeting of sides, ends and roof; and between all metal-to-metal joints, and use of hair felt. Floor of key section steel, the troughs being filled with cork. A layer of cork covers the whole of the key flooring, and on this are laid the wood slats Interior designed to avoid dust-collecting ledges. Bright surfaces requiring cleaning have also been avoided. Interior decoration in green and brown. Fittings are of aluminium. Straps are attached to sockets suspended from the roof.

CAR NO. 822.—METROPOLITAN CARRIAGE, WAGON AND FINANCE CO., LIMITED.

Special features include nickel steel for the undergear; the flooring is of corrugated steel with a thickness of non-inflammable wood and a fluted covering of fire-resisting rubber; white metal sheets are used for panelling; natural non-inflammable material is used for seat-rests, &c.; and that sliding doors are self-centering. To reduce noise the wheels are filled in with teak segments, sound insulating materials are used freely, and the painting scheme includes the use of Docker " loaded " paint, having qualities which assist to deaden sound vibrations. The bogies are completely shrouded with pulped wood sheeting, with flap doors for inspection. The ends are stream-lined.

Bogies have 2 ft. 8 in. wheels, laminated side bearing springs fitted with Spencer's auxiliary rubber springs, double elliptical bolster springs are provided, and " Metro " patent ball-bearing centre plates and roller side bearings are fitted to reduce friction. Underframe includes bulb angle section solebars, and pressed steel headstocks, bolsters, cross bars and longitudinals, and has reinforced end construction. " Ferodo " is used extensively for bogies and underframes, and elsewhere. The body consists of light steel pressings for pillars, and angle sections for bracings, longitudinals, side members and roof. Side and end plates are of aluminium and copper alloy. Windows each consist of two complete steel pressings. Spaces between the inner and outer sheeting of walls and ceilings are sectionalised by small wood packings, to reduce " drumming," the spaces being filled with eel grass quilting, a material useful both for sound and heat insulation.

Sliding doors include aluminium plates, light steel channels and wood linings, spaces being filled with eel grass quilting. A ball-bearing attachment between the door-operating air motor and the door minimises sliding friction. A new type of door roller is employed, enabling the door to be readily removed without disturbing the runner track, while V rollers provide for self-centering. There are also twin ball races giving correct alignment. Special arrangements are made to obtain weather-tightness between the doors, while the meeting edges are fitted with rubber joints which enable a passenger (or his clothing) who may be trapped to withdraw.

Windows have drop lights apparently frameless, provision being made for easy cleaning, adjustment and withdrawal, to avoid rattle, and for draining rain water. Ventilators in the clerestory are of " M. & M." pattern, with staggered air openings. Air scoops are also fitted. Half the seats have small closely-netted springs, with spiral springs for the backs; the others have seats and backs of woven wire with supplementary

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spiral springs. All seats are in self-contained frames, these and the backs being removable. Seat risers and top plates are heavily shrouded to reduce noise. Straphangers are of light grey rubber with strong canvas inserted. Electric lamps are sunk in flush with the spherical bulb, the lights themselves being of opalescent or frosted glass. Dust-collecting ledges, &c., are avoided. Ceilings are of "Agasote" fire-resisting millboard, with light upper decoration. Fittings are of bronze. Upholstery is in blue, and the interior of the car has mahogany and maple panelling.

CAR NO. 720.—UNDERGROUND COMPANIES' DESIGN.

(*Constructed by the Gloucester Carriage and Wagon Company.*)

Interior decoration in brown with white panelling, and ceiling fittings in oxidised copper. Lighting entirely by side brackets, except for two emergency lamps in centre. Seats of "Nesta" all-metal design, covered with moquette, and the arm-rests with leather. Straps include "Bakelite" handles on swivel joints attached to clerestory rail. Ceiling decorated in the "Adams" style. To reduce noise the roof and body are insulated by sheet cork and "Wadnit" asbestos, the flooring, which is otherwise to the usual "Underground" standards, being similarly insulated but having different thicknesses of material. The bogies are of an improved design not hitherto used. They are provided with shrouding of "Wadnit" asbestos secured to underframes of wheel boxes, "Sundela" board panels being used on sides and ends of bogies. The exterior body panels are of steel, the interior panelling being of asbestos millboard. Doors have wood frames covered on either side with aluminium plates. Special attention is given to weather tightness, while a drainage sytem is provided to avoid rain entering. The side sliding doors have rubber edges to prevent injury to a passenger who might be trapped or his clothing caught, as in the case of the other cars.

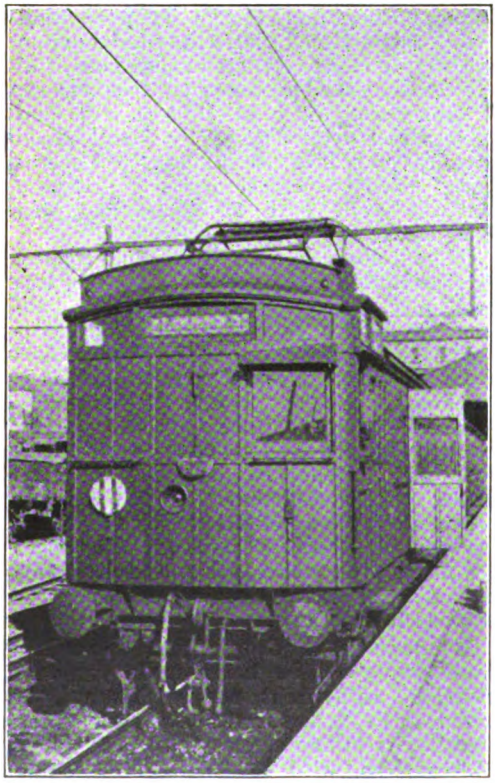

Photo.] [*A. A. Bowles.*

ELECTRIC TRAIN AT ST. KILDA STATION.

ELECTRIC TRACTION IN MELBOURNE.

IN the March, 1920, RAILWAY MAGAZINE we described the electrification of the Melbourne suburban lines, Victorian Government Railways. The photograph reproduced, sent by Mr. A. A. Bowles, of Sydney, New South Wales, is of interest in that it shows one of the electric trains in ordinary service, ready to leave St. Kilda for Flinders Street station, Melbourne. The first electric train ran on May 29, 1919. It is intended that eventually all the Melbourne suburban lines will be electrically operated. Direct current at 1,500 volts is used, supplied through overhead conductors.

New stock has sliding doors, though the view shows a vehicle with swing doors.

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RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post from the RAILWAY MAGAZINE Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d. The twenty-sixth Annual Edition (1923) is in preparation and it will be published as soon as the final figures for 1922 are available.

Colwall and Ledbury Tunnels, Great Western Railway.

We are informed by the Superintendent of the Line's Department of the Great Western Railway that trains are worked through these single line tunnels on the electric lock-and-block system of train signalling, which prevents more than one train being in the section between two block signal-boxes at the same time. This is accomplished by a signalman not being able to lower his starting signal (or the signal controlling the entrance to the block section ahead) until that signal has been electrically released by the signalman at the signal-box in advance, who cannot so release the signal until the preceding train has reached the electric treadle fixed near his signal-box. Neither can he release it if he has lowered his electrically-locked signal for a train coming from the opposite direction.

[Reply to "SILURIAN."]

Braking Trains.

Your query is far from clear. Obviously, the brake, wheel and rail are all factors in the braking of the train, but we do not see your difficulty. Primarily, a brake block, by the pressure applied to it opposes a frictional resistance to the passage of the tyre surface past it during revolution, and thereby uses up the energy represented by the travel of the train which would otherwise cause the train to continue to run until all this energy had been dissipated by gradual slowing up for lack of propulsive power (from engine or due to gravity) and from frictional resistance. Only if the wheel stopped revolving would the rail enter the problem, resulting in the wearing of "flats," or probable "skidding," or "sliding" between wheel and rail with excessive wear on both, and loss of braking effect.

[Reply to "ARGUMENT."]

Loop Line, Downpatrick.

In reply to your query, Mr. C. A. Moore, General Manager, Belfast and County Down Railway, explains that the "Loop" line referred to is a connection by which trains can be run direct from Belfast to Newcastle or Ardglass, without going into Downpatrick station. This line was constructed in 1892, on the opening of the Ardglass line, and is used daily for certain through trains to Newcastle, as shown in the time-tables, the connection to and from Downpatrick being made by the Ardglass branch train. The Ardglass branch train works out from Downpatrick station to a local platform situated at the Newcastle end of the loop line.

[Reply to G.R.M.]

Model Locomotives.

With a view to cheapening the cost of construction, "mass-production" locomotive models are frequently designed on lines bearing a general resemblance to more than one locomotive prototype, and are then supplied in various colours, to match the colours adopted by different

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railways. The model 4-4-0 tank noted by you in Midland colours doubtless comes in this category, as, with the exception of one or two small 4-4-0 outside cylinder tank engines (off the Midland and Great Northern line), there are no tank engines of this wheel arrangement running on the Midland system.

[Reply to L. B. HEWITT.]

Banking Locomotives.

Presumably the locomotive you saw, attached in rear of a double-headed goods train, was giving banking assistance either because the load or the steepness of the gradient rendered this necessary, or because of a rule requiring an engine in rear in case of a breakaway. Caledonian Railway shares are still quoted because that company is not yet incorporated into the London Midland and Scottish Railway, though it is included in the "unified working," now in operation.

[Reply to J. C. MORDEY.]

Automatic Brakes and Grouping.

Some consideration has, we understand, already been given to the situation which will arise due to the association of previously distinct lines using different brake systems, but no definite announcement of policy is to be expected yet awhile, and for some time, at least, the present situation is hardly likely to be materially altered. Like many other readers, you are in too great a hurry; this and other incidental problems arising out of grouping must await their turn for settlement.

[Reply to A. A. COX.]

South Eastern and Chatham Railway Locomotives.

You are correct in assuming that the lower number noted by you is that of the shed to which the engine is attached. Shed numbers are:—1, Battersea; 2, Bricklayers' Arms; 3, Cannon Street; 4, Slades Green; 5, Tonbridge; 6, Ashford; 7, Orpington; 8, Purley; 9, Redhill; 10, Gillingham; 11, Dover; 12, Hastings; 13, Ramsgate Town; 14, Margate West; 15, Maidstone East; 16, Maidstone West; 17, Faversham; 18, Reading; 19, Folkestone.

[Reply to J. M. BAILEY.]

Light Railways.

Usually these make connection with a main line system, and because of the traffic importance, light railways of tramway character generally centre upon the railway station, but there is no imperative need for this, and in particular instances light railways and tramways have no direct connection with a standard railway. In the case of the Corringham Light Railway its principal importance, we understand, is for the conveyance of Messrs. Kynoch's workers, and to meet the needs of the immediate locality.

[Reply to G.R.M.]

Birmingham to North Wales, L.M. & S.R.

Reference to non-stop timing on Saturdays only between Birmingham and Prestatyn, given on page 282 of the October issue, 1922, is correct; the starting time was 12.55 p.m., as correctly shown, and no reference was made in the table to the 12.15 p.m. train mentioned by you, which makes various intermediate stops. Runs over the various portions of this route have been described in Mr. Cecil J. Allen's articles from time to time.

[Reply to A. T. DAVIS.]

Metropolitan and Great Central Joint Lines.

The Quainton Road and Brill branch is leased to the working companies jointly, though usually it is worked by a Metropolitan engine and rolling-stock, that company's trains also working exclusively to Verney Junction. Both companies run trains to Chesham. As it is intended to work the new Watford branch electrically, it will almost certainly be worked by Metropolitan trains.

[Reply to "MOUNTAINEER."]

Shepherd's Bush Connections.

Parliamentary powers were obtained for connecting the Central London and London and South Western Railways at Shepherd's Bush, as described in our April, 1920, number, but nothing has been done further, and we gather that the newer scheme for connecting the Piccadilly section of the London Electric Railway with the same line has superseded the earlier scheme.

[Reply to E. K. D.]

Southern Railway Locomotives.

It is quite probable that in due course locomotives belonging to each section will eventually be worked through or be used upon others, but for the time being no important changes are to be anticipated.

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Similarly, the lettering of the rolling-stock and standard colours, etc., are details which will be settled in due course, though they will probably be introduced only when re-painting becomes necessary.

[Reply to "260."]

Great Western Railway Main Line Express Train Loading.

We are not aware of any definite limits being set on this railway to the loads taken by the locomotives on the principal express trains, except on some of the sections of exceptional grading, such as between Newton Abbot and Plymouth; even in the latter case the matter of taking a pilot or not is generally left to the driver's judgment rather than being on any fixed basis of load.

[Reply to E. LITTLE.]

Great Northern Railway "Atlantics."

Except for the experimental 4-4-2's (Nos. 271, 279, 292, 1300 and 1421), the small-boilered engines of "990" type, and the 5 ft. 6 in. boiler "Atlantics" of the "251" class, which latter include also a series numbered from 1400 to 1461 inclusive, the majority of both types have now been superheated; Nos. 1452–1461 were the only engines of the class to be built with superheaters.

[Reply to "ATLANTIC."]

Southern Railway Express Trains (London and South Western Section).

Locomotives principally employed on the chief services are the "Urie" 4-6-0's of the "736," series, the superheated "Drummond" 4-cylinder 4-6-0's, and the superheated large "Drummond" 4-4-0's numbered in the 400's. Majority of the "Drummond" 4-6-0's are employed on main line goods services.

[Reply to A. N. L. MACLACHLAN.]

Cheltenham Lines.

We have no information as to projected widenings and other improvements in regard to railways in the Cheltenham district. The Midland and South Western Junction Railway is to be amalgamated with the Great Western Railway under the grouping scheme. We cannot say what alterations in regard to train working will be made in the future.

[Reply to "CHELTENHAM."]

Numbers of Locomotives.

Please read the rules. We cannot undertake to give particulars of numbers of locomotives of particular classes. The RAILWAY YEAR BOOK gives totals of each type, but not of individual classes. We believe there are five or six further engines of the Great Western Railway "4700" class, and there are 167 tank engines of the 2-6-2 type.

[Reply to A. ROUND.]

London Midland and Scottish Locomotive "Cornwall."

When used for its ordinary purpose, as the Chief Mechanical Engineer's inspection locomotive, this engine has a tender combined with a saloon, and is generally illustrated in this form. When further accommodation is required, or it is intended to attach the engine to a train, an ordinary tender is substituted.

[Reply to R. A. WHEELER.]

Mr. D. Earle Marsh.

Mr. Earle Marsh retired from the position of Locomotive Engineer of the London, Brighton and South Coast Railway towards the end of 1911, when he was succeeded by Colonel L. B. Billinton, who now holds the position. Your remarks concerning various rebuilt locomotives are of interest but hardly call for reference here.

[Reply to R. A. WHEELER.]

Four-Cylinder 4-6-0 Engines, Great Western Railway.

Position of outside cylinders, in rear of the bogie centre-line, is adopted in order to equalise the length of connecting rods as between inside cylinders (which drive the leading coupled axle) and outside cylinders (which operate the middle pair of coupled wheels).

(Reply to "CAOUTCHOUC."]

Through Carriage Workings.

We suggest that you endeavour to obtain answers to your inquiries of this class from the staff accompanying the trains. To give you a reply would necessitate inquiry at headquarters, which is hardly justified when the subject is not of general interest.

[Reply to "SILURIAN."]

Light Railways and Grouping.

We have already explained on several occasions that light railways, except those

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which were already associated with larger railways, are outside the grouping scheme. This applies to the Weston, Clevedon and Portishead Light Railway, and a considerable number of other lines.

[Reply to A. H. R. ELTON.]

Mossley Hill, London Midland and Scottish Railway.

Mossley Hill is 189 miles, 58 chains (centre of station) from Euston by the late London and North Western main line, and the position of the 190th milepost just beyond the station concerned is perfectly correct.

[Reply to W. G. POLACK.]

Great Eastern "Decapod."

Though completely successful on her trials, this engine was never actually put into service, and after a short career converted into an eight-coupled goods engine was scrapped. No. 20 was the only engine of this type to be built.

[Reply to "CIRENCESTRIAN."]

London and North Eastern (North Eastern) Railway 4-4-0 Engines.

4-4-0 No. 1238 belongs to the "R1" class, designed by Mr. Wilson Worsdell, as a development of his "R" class, with 5 ft. 6 in. boilers, and numbered from 1237 to 1246 inclusive.

[Reply to A. N. L. MACLACHAN.]

Railway Staff Prospects.

The rank of inspector follows many years' experience in the grades leading up to it. Apparently you refer to traffic positions, and it would be necessary to take up with the staff department of the railway whose service you desire to enter.

[Reply to S. L. D.]

Sand Hutton Railway.

This is not a public line and therefore does not appear in the *Railway Year Book*. It was fully described in the RAILWAY MAGAZINE for March, 1914, from which you will see that it is a private estate line.

[Reply to G.R.M.]

Midland and South Western Junction Railway.

By the terms of the railway grouping scheme this line, which is not a *joint* railway, is to be absorbed in the Great Western system.

[Reply to "CIRENCESTRIAN."]

London and North Western 2-4-0 Engines.

Those with 6 ft. 6 in. driving wheels are known as the "Newton" or "Precedent" class, and those with 6 ft. wheels as the "Samson" or "Waterloo" class.

[Reply to "ENVOY."]

South African Electric Locomotives.

You are correct in assuming that this is a printer's error. Overall height of these locomotives is 13 ft. The body is 40 ft. 8 in. in length.

[Reply to G. W. PALMER.]

Edinburgh Waterworks Railway.

We have no further information concerning this line, described in the February, 1906, number of the RAILWAY MAGAZINE.

[Reply to N. JACKLIN and T. G. RIMINGTON.]

The "Planet."

The original "Planet," built in 1830, was constructed by Stephenson.

[Reply to N. JACKLIN and T. G. RIMINGTON.]

Profile, Waterloo—Basingstoke.

Last reproduced in Mr. Cecil J. Allen's "British Locomotive Practice and Performance," November, 1914.

[Reply to F.H.V.P.]

New Street Station, Birmingham.

This station was described in our "Notable Railway Stations" series in January, 1900, and again in 1915.

[Reply to S. J. C.]

South Eastern and Chatham Railway Locomotives.

Your description of the apparatus on No. 232 is not very clear, but we take it to be a top-feed arrangement.

[Reply to R. H. YOUNG.]

Signals Out of Use.

A cross attached to semaphore arms in the manner shown in your sketch indicates that the signal is temporarily out of use.

[Reply to A. M. G.]

South Eastern and Chatham Railway "Mogul" No. 815.

This is a 2-cylinder and not a 3-cylinder 2-6-0 engine. [Reply to G. T. HART.]

Gowdall and Braithwell Railway.

An article on this line appeared in the October, 1922, RAILWAY MAGAZINE.

[Reply to J. M. ADAMS.]

No. 1470 Great Northern Railway.

This engine carries the name plate "Great Northern."

[Reply to AIDAN CRAVEN.]

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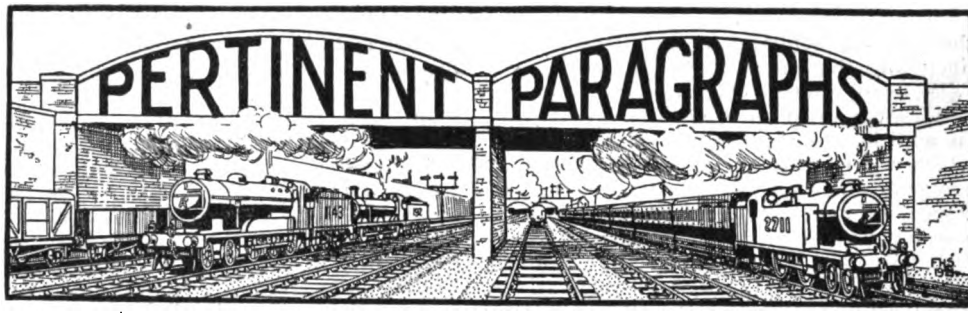

Railway Reports for 1922.

As the last issued by the railway companies which have been grouped, the annual reports for 1922 possess interest in many ways. They are also important for the reason that, for the first time since those issued in February, 1914, for the year 1913, they include details of railway operation. During the intervening years all such information has necessarily been modified by the fact that, until August 15, 1921, the railways were subject to Government control under guarantee conditions, so that particulars relating to operating revenue and expenditure could not be given. The fact that part of 1921 also came under this arrangement rendered it necessary for the reports for that year to be prepared on the same system. For 1922, however, all such restrictions and complications are removed, and, except for the fact that in certain groups the companies which were to be amalgamated have, since decontrol, continued operation as between themselves on very similar lines, so that the details now given represent rather the apportionment between them of traffic receipts than the actual results, the 1922 reports give a very accurate indication of the post-war railway situation, after the transition years had been passed, and immediately prior to grouping. In the case of railways which were amalgamated during 1922, such as the Hull and Barnsley and most of the lines now incorporated in the Great Western Railway, complete information directly comparable to that of 1913 is not, of course, available. The fact that the reports of most of the principal railways give information which is directly comparable is, however, a matter of considerable interest and will, no doubt, provide material for many interesting studies.

During 1922 most of the companies have had the benefit of the second instalment of their shares in the £60,000,000 allocated in settlement of war-period claims under the Railways Act of 1921, but in most cases, and sometimes without utilising these amounts at all, the working results of 1922 are distinctly favourable. In some cases it has been possible to declare increased dividends on certain stocks, though it is probable that this is in the nature of a settling up before passing into the new combinations, but in every instance standard dividends have been maintained, if not increased. The Irish railways are necessarily in a special and difficult position, In every way the positions of the leading railways as they pass into the new systems are much more favourable than was thought to be possible a year or so back, and it is not surprising that in financial circles railway securities have again attained a sure and certain standing.

Railway Compensation.

THE Railways Amalgamation Tribunal on January 31 approved the Fourth Scheme of Allocation unanimously agreed among the companies concerned for the distribution of the sum of £25,000,000 payable under the Railways Act, 1921, in respect of arrears of "maintenance and renewal of way and works and/or rolling-stock" among the 62 companies participating in the allocation. The Schedule to the scheme sets out clearly the arrears claimed by each company and their division under the heads of way and works and rolling-stock respectively, while the last column of the Schedule shows the proportion of the total sum allocated to each participating company. Twenty of the 82 companies entitled under the Act to participate are declared to be not in arrear in respect of maintenance or renewal, and these are accordingly excluded from the distribution. Of the 62 companies included, a number, of course, no longer exist, having been amalgamated or absorbed in the groups, but as the claims are based on the arrears existing at December 31, 1920, they are properly set out under their original titles in the scheme.

Actually, the money will be paid principally to the new groups, save for a sum of £777,528 payable to companies which do not come under the grouping scheme. Thus, excluding small amounts due to a few subsidiary companies not yet actually absorbed, the Southern Company receives £2,986,540; the Great Western £5,515,327;

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the London Midland and Scottish Group (including the North Staffordshire and the Caledonian) £8,625,398; and the London and North Eastern Company £7,095,207. In addition to these sums, the £5,000,000 which was allocated in advance last May as compensation for abnormal suffering in respect of standardisation of rates of pay, working conditions, &c., has now been distributed among the companies, making a sum of £30,000,000 in all. There is still a final distribution to be made, of amounts in dispute on the earlier schemes, a balance of the £500,000 allocation, and of interest on the various sums deposited with the bankers, totalling over £1,000,000 in all, which will doubtless come before the Amalgamation Tribunal for approval shortly.

Railway Company Maps.

WHEN in 1913 the Railway Accounts and Returns Act came into operation, it became necessary for the railway companies to include in their Annual Statements to shareholders a map of the railway, setting out certain information. The idea was an excellent one, but the value of the maps was spoilt by the widely varying scales employed for them. Now that the railways are in four groups it may be suggested that some definite arrangements should be come to regarding the scale of these maps. Assuming that the map be on a fair scale—say, 7 miles to the inch, which is the scale employed by the Furness Railway, a sheet of considerable size would be necessary. In the cases of the London Midland and Scottish Railway and the London and North Eastern Railway, which have each a length disproportionate to their breadth, the maps would need to be shown in two sections on the sheet. There is almost a year in which the question can be debated, but it is desirable that the Railway Reports for the year 1923, be accompanied by well drawn, clearly lettered maps with bold lines, and showing distinctly all the particulars required by Statute, on a scale sufficiently large to make the maps of value.

Need for a Uniform Scale.

THE scale employed and the style of engraving vary considerably in the maps now issued with the annual reports. Some railways have been unduly lavish, whilst others have been so parsimonious as to make their maps practically useless. Even some which have adopted a fair size scale, have employed so thin lines and so small type that the map is of little value. Other railways employ wide margins, so reducing the scale.

Among railways which gave no scale on the maps was the Great Eastern (about 20 miles to the inch, but page of sufficient size to display the map on 12 miles to inch scale); Great Central (about 20 miles to the inch, but map very clearly drawn); Glasgow and South Western (about 11 miles to the inch); and London, Brighton and South Coast (about 8 miles to the inch). Other scales employed were:—North Staffordshire, 7½ miles to the inch; South Eastern and Chatham, 9 miles; North Eastern, 10 miles; Lancashire and Yorkshire and Great Northern, 15 miles; Midland, London and South Western, and Caledonian, 17½ miles; North British, 20 miles; and London and North Western, 25 miles to the inch. The last, although on a small scale, only shows the principal stations, but is so clearly drawn that it compares most favourably with other railway maps on a scale 150 per cent. larger.

A Twelve-track Railway.

THE Southern Railway owns a length of railway which, it is believed, has the greatest number of parallel running tracks in the world. From London Bridge station to Blue Anchor signal cabin, a distance of 1½ miles, there are for part of the way 12, and for the remainder 11, parallel sets of tracks, with no walls or other divisions between them and all busily occupied by up and down trains. Originating in a pair of tracks owned by the London and Greenwich Railway, opened in 1838, additional lines have from time to time been added by the South Eastern and Chatham and London, Brighton and South Coast Railways, until for many years past there have been twelve sets of running lines between the points named. Prior to January 1 some of these lines were owned by the South Eastern and Chatham Railway and the others by the London, Brighton and South Coast Railway, but they now all form part of the Southern Railway. At Blue Anchor cabin the three tracks of the South London line diverge, and a few chains further on, at Corbets Lane Junction, the London, Brighton and South Coast Railway's main line parts company with the South Eastern and Chatham Railway. A short distance beyond, the six tracks of the South Eastern and Chatham Railway separate, four running on one viaduct and two on another.

New Pullman Dining and Buffet Cars.

THE Midland Railway-Carriage and Wagon Company, Limited, Birmingham, recently constructed, to the order of the Pullman Car Company, Limited, two first and third-class dining cars, for service on the Caledonian (L.M. & S.) Railway, and three third-class parlour buffet cars for use on the London, Brighton and South Coast Section

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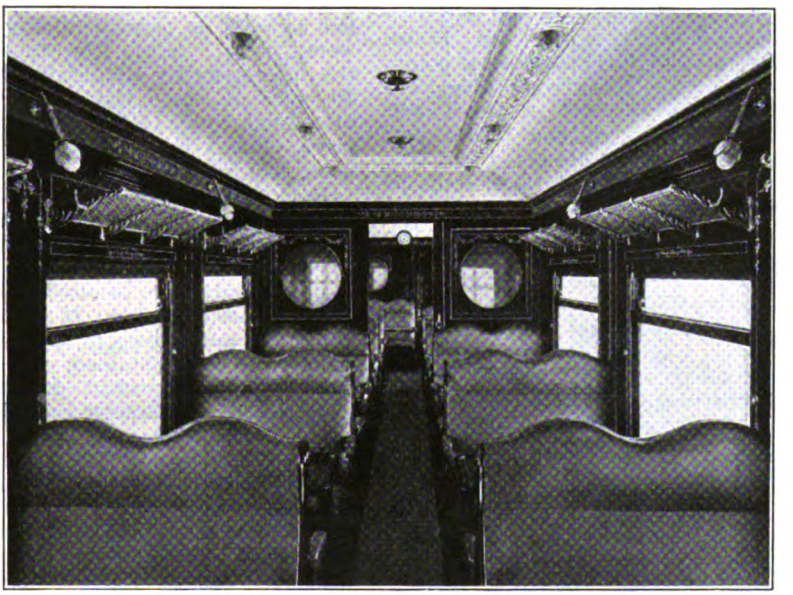
of the Southern Railway. The third-class parlour buffet cars are identical with the dining cars as regards the overall lengths, centres of bogies, &c., but are 8 ft. 6 in. wide over mouldings, and 8 ft. 7 in. over cornices, the tare weight being 31 tons 5 cwt. The dining cars are designed to accommodate 30 passengers—18 in the large saloon and 12 in the small saloon, and the third-class cars will seat 47 passengers. A noticeable feature of these new cars is their low tare as compared with the car of standard Pullman construction, and the reduction in weight has been effected by using all-steel underframes and bogies, which permits of the body framing being made considerably lighter.



SALOON IN NEW THIRD-CLASS PULLMAN PARLOUR BUFFET CAR, SOUTHERN RAILWAY, LONDON, BRIGHTON & SOUTH COAST SECTION.

The two Caledonian dining cars (an interior view of one was reproduced in the January, 1923, RAILWAY MAGAZINE) are named respectively *Lady Nairne* and *Bonnie Jean*, and are identical in all respects, with the exception of the finish in the saloons. In the *Lady Nairne* the saloons are decorated in finely figured mahogany, with "Adams" decoration carried out in finely shaded inlays. The oval panels are a special feature, these being composed of a fine selection of curl mahogany veneer, giving a very fine effect. The dining chairs are in mahogany, upholstered in green leather and finished with gilt nails, and the carpet is of rich green velvet pile. In the car *Bonnie Jean* the interior panelling is in finely figured mahogany, with quartered panels, having inlaid floral decoration carried out in natural colours, the predominating note being green with rose coloured flowers. The dining chairs are upholstered in crimson leather, the carpet being of crimson velvet pile to match. The seats of two of the third-class cars are upholstered in green, with carpet strips to match, and the third in crimson, the floors being covered all over with thick green linoleum. The dining tables are of the removable type, and have polished mahogany tops to harmonise with the interiors, and are finished with plate glass on the upper surface. In both cars, the ceilings are of the domed type with coved sides and panel centres, the wall brackets, basket racks and other metal work being designed to harmonise with the general scheme.

The London, Brighton and South Coast third-class cars are finished in mahogany with simple and tasteful decorations of inlaid wood, the decorations being different in each car.

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Exteriorly the cars are finished in the standard Pullman colours—umber and cream—tastefully lined with gold, the names of the cars, and the Pullman Company's coat of arms being indicated on each side, in the usual way. The cars have been built generally in accordance with the Pullman Car Company's specification and to the designs of the Midland Railway-Carriage and Wagon Company, Limited, the whole contract being carried out to the instructions and under the supervision of Mr. Thomas Powell, Secretary and Manager of the Pullman Car Company, Limited.

Midland Railway General Managers.

IN view of the statement sometimes made that the Midland Railway has had only five general managers, of whom Mr. Frank Tatlow was the last, a contemporary points out that in reality there were nine. On the amalgamation in 1844 of the North Midland, the Birmingham and Derby, and the Midland Counties Railways, there was not, of course, room for the three staffs of officers, and the new positions were given to those who had been connected with the largest of the three associated companies. Mr. P. Clarke, who had been Superintendent of the North Midland, became General Manager in July, 1844, and Mr. J. Sanders, was appointed General Superintendent as regards the management of all trains in the coaching department, in July, 1849. Mr. Sanders became General Manager in January, 1850, and occupied that position until September, 1853, while on October 1, Sir (then Mr.) James Allport became General Manager. About September, 1857, Sir James Allport relinquished the General Managership, and became engaged in important shipbuilding operations in the north, meanwhile occupying the position of a Midland Director. Mr. W. L. Newcombe was appointed as General Manager in his place on October 1, 1857, but in April, 1860, Sir James Allport resumed the post of General Manager. He continued to occupy that office until February, 1880, when Mr. John Noble was appointed as his successor. Mr. George H. Turner was appointed General Manager in succession to Mr. Noble in May, 1892, and continued as such until June, 1901, when he was succeeded, in July, by Mr. John Mathieson. Sir (then Mr.) W. Guy Granet succeeded Mr. Mathieson in July, 1906, and Mr. Frank Tatlow followed as General Manager at the end of 1918.

Brighton Electrification Results.

SOME interesting facts and figures relating to the electrified portion of the suburban lines on the London, Brighton and South Coast Railway were given in a paper read before the members of the Institution of Civil Engineers by Mr. H. W. H. Richards, Traction Engineer, who said that certain portions of the suburban lines had now been worked by electric traction for about 12 years, and these sections had performed useful railway work under conditions which had not been unduly favourable to the system adopted, and which were not expected to continue for so long a time. Mr. Richards dealt technically with the rolling-stock and its equipment and with the electric track equipment, and said that the presence of the overhead line had not been found to inconvenience unduly the permanent way department, and that it had not been necessary to pay the special weekly "danger" allowance to men who had to work on permanent way where there were "live" rails. The total length of the line operated electrically amounted to 70 miles of single track, and the number of annual traffic delays of 15 minutes or more, caused by overhead equipment defects, had varied from one to eight only.

Referring to the electrical equipment and rolling-stock, Mr. Richards mentioned that most of the motor troubles have been due to weakness in the mechanical design, and improvements have resulted in train defects being reduced by about 75 per cent. Gear-wheel and pinion lives of 250,000 miles have frequently been obtained, while with solid gear wheels of present day manufacture lives up to, or perhaps exceeding, 500,000 miles are anticipated. Only five defects have occurred among 71 transformers of the 310-k.v.a. type, many of which have now reached 500,000 miles. General overhaul of motor-coaches takes place at 60,000 miles, equivalent to 18 months' running, and of trailer-coaches at 120,000 miles. On sections where there is no steam traffic, the renewal of catenary and dropper wires necessitated by corrosion is only about 10 per cent. of that on sections where a heavy steam traffic is still running. During 1921 the averge energy-consumption was 75·8 watt-hours per ton-mile, the train service being 5,959,737 coach-miles, with a distance between train stops of 1·14 mile, an average running-speed of 24·36 m.p.h., and a schedule speed of 22·11 m.p.h., including stops.

Private Locomotives on a London Railway

THE fundamental view of a railway was better expressed in the early appellation "railroad." The idea being that the railroad proprietors should provide the track, and that anyone upon payment of tolls could run their own trains over the railroad. The practical impossibility of this method was apparent almost from the first, and traffic working by the railway's own locomotives speedily became general. There

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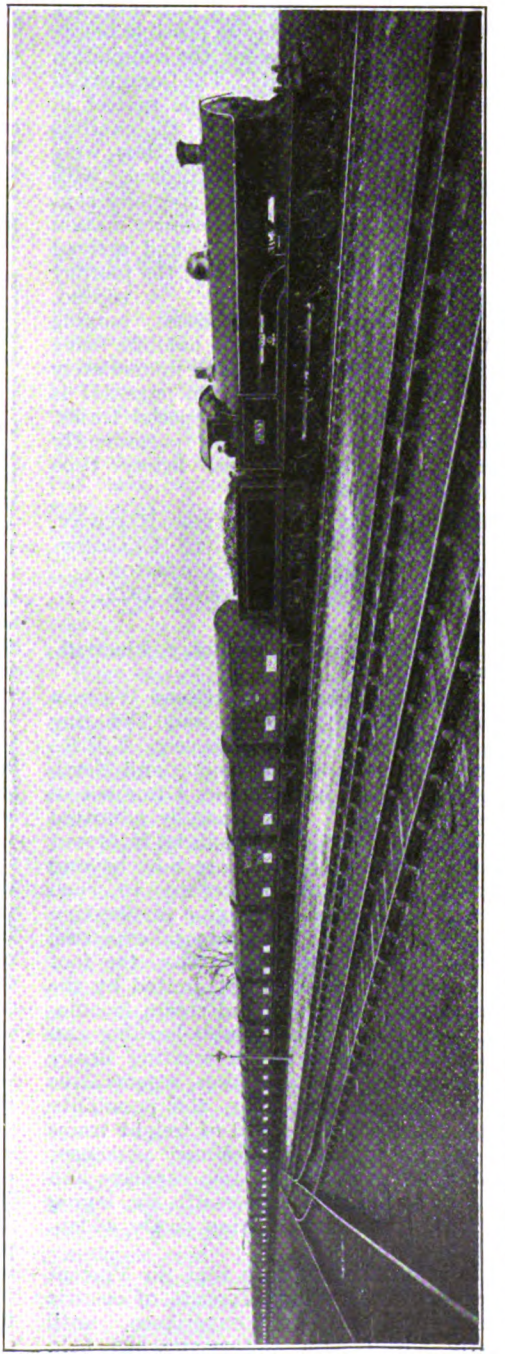
are on most railways certain short sections over which the owners of adjacent collieries, works or mines have retained a restricted user of the company's line under special conditions safeguarding the ordinary traffic. It will probably be news to most of the readers of the RAILWAY MAGAZINE to learn that for many years the whole of the coal traffic on the North London Railway was worked by a private firm with its own locomotives. It was not till early in 1859 that the arrangement with the Northumberland and Durham Coal Company was determined by the North London Railway. Under the agreement the Northumberland and Durham Coal Company paid the North London Railway a minimum definite sum of £10,000 a year for the sole right to establish coal depôts on the system. The coal company brought the coal from the north of England by collier to Poplar Docks. Here it was loaded in the coal company's own railway wagons and hauled by its locomotives to its various depôts on the North London Railway, and to gas works, sometimes also being handed over to other railways at junction points.

Buying out the Concessions.

If the North London Railway directors could have foreseen the development of coalfields in the Midlands nearer London, they would not have desired to determine the concession, as the fall in the price of coal consequent upon the competition of these nearer coal fields would have made the Northumberland and Durham Coal Company willing to give up their agreement. The payment of £10,000 a year increased pro rata with the tonnage of coal, when the latter reached the maximum mentioned in the agreement. The North London Railway paid the Northumberland and Durham Coal Company £43,000 for the cancellation of the agreement and for the coal company's locomotives, wagons and other plant. By cancelling the agreement the railway obtained control of the whole traffic passing over its system, but otherwise, it does not appear to have made a good bargain.

With regard to these Northumberland and Durham Coal Company's locomotives, Mr. A. Rosling Bennett, who has a wonderfully good and long recollection of early locomotives in the London area, states that about 1863 he remembers seeing two then apparently very old 0-6-0 tender engines engaged exclusively on coal trains on the North London Railway. They suggested to him early Stockton and Darlington Railway engines. They had outside frames, big domes and small safety valve pillars on the boiler barrels.



A TRAIN OF TWENTY-THREE SPECIALLY CONSTRUCTED MOTOR CAR VANS *EN ROUTE* FROM COVENTRY TO GLASGOW.

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A Special Train of Motor Exhibits.

In connection with the Motor Exhibition at Kelvin Hall, Glasgow, which opened on January 26, the London Midland and Scottish Railway made special arrangements for the transport of exhibits from the Coventry district. To meet the requirements of the manufacturers, it was necessary to allow them as late a day as possible before the opening of the Show for the completion of the work on the exhibits. The Commercial Department at Euston took the matter in hand and it was decided to run the exhibits by special trains, as and when they were ready for conveyance. In accordance with this plan, the first train of 23 specially constructed motor car vans left Coventry station at 12.20 a.m. on January 19, and arrived at Glasgow 10.55 a.m. same day, the journey occupying 10 hours 35 min. A second, third and fourth train followed, making equally good journeys, all the exhibits being removed to the Exhibition Hall immediately on the arrival of the trains. On page 251 is an illustration of one of the special trains, on the vans of which were prominently displayed specially printed, heavy type posters, which read :—

LONDON MIDLAND AND SCOTTISH RAILWAY.
SPECIAL TRAIN, COVENTRY TO GLASGOW.
EXHIBITS FOR MOTOR EXHIBITION.
JANUARY 26 TO FEBRUARY 3, 1923.

Sir Vincent Raven on Railway Electrification.

A PAPER read before the Great Western Railway (London) Lecture and Debating Society by Sir Vincent Raven, K.B.E., Technical Adviser to the London and North Eastern Railway, brought out a number of interesting points. It is generally admitted that many of the claims advanced in favour of main line electrification are now beyond question, particularly in regard to such matters as the saving in engine preparation and shed time, with their incidental expenses, as compared with steam practice, the fact that tractive capacity is not limited by the boiler capacity of individual steam locomotives, ease with which double-heading can be adopted, superiority in starting heavy loads, more rapid acceleration, regenerative braking and, in particular, the possibility of approximating the speed of freight trains more nearly to that of ordinary passenger trains, thereby increasing line capacity and probably avoiding the necessity for laying additional tracks and making costly widenings.

It is interesting to note that Sir Vincent Raven—now a leading advocate of electric traction—had all his experience, until recently, with steam practice, in which field he was and is an acknowledged leader, while Mr. C. B. Collett, Chief Mechanical Engineer, Great Western Railway, also a leading and experienced steam locomotive engineer, together with other chief railway officers, favourably considered many of the claims advanced. The lecture, and the discussion which it produced, together indicate very strongly the case in favour of electrification, main line, suburban and freight; the main trouble is the cost of conversion and the fact that so great a change can only be made by degrees and must be achieved in the natural course of development for that reason.

French Express Train Services.

WE are indebted to Mons. G. Vuillet, a Paris reader, for an exceedingly interesting letter commenting on "Voyageur's" article in the December issue on the French express train services of 1922, and, incidentally, pointing out a few minor errors therein. In the table of longest runs, the Paris-Orléans Railway should have been credited with two journeys, one in each direction, between Chateaudun, on the line from Paris to Tours *via* Vendome, to Saumur, passing Tours without stopping; the distance is 102·8 miles, and the trains concerned were the summer *rapides* between Paris and Le Croisic, on the Brittany coast. The 10.40 a.m. from Paris made the run in 137 min., at an average speed of 45 m.p.h. On the other hand, the distance from Anjoulème to Bordeaux by the same railway was overstated, being actually 83½ and not 86½ miles; the explanation is that the extra 2¾ miles is allowed in the fare calculations to cover interest on the capital cost of the bridge across the Gironde at Bordeaux. Our correspondent also mentions several short runs slightly superior in speed to those given in the "Fastest Runs" table; on the Midi, train No. 167, from Paris through to Fort Romeu, runs the favourably-graded 36·7 miles from Carcassonne to Narbonne in 42 min., at an average of 52·4 m.p.h., and on the État the through Amiens-Le Havre express No. 203 is booked from Yvetot to Breauté, 15·6 miles, in 19 min., at an average start-to-stop speed of 49·1 m.p.h. The Paris-Lyons-Mediterranean run given has a service stop at Cosne, and covers the 48·1 miles from there to Montargis in 58 min., which faintly raises the average speed to 49·8 m.p.h. Since the beginning of October further important accelerations have taken place. The fastest run in France is now made by the 18.20 Paris-Brussels *rapide* No. 123, which is only allowed 97 min. for the 95·1 miles, which equals 58·8 m.p.h., and still includes the war hindrances north

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of Chauny referred to in the article. The corresponding up express runs from Feignies to St. Quentin, 48·4 miles, in 50 min., at an average of 58·1 m.p.h., and is allowed 107 min. thence to Paris. On the Paris-Lyons-Mediterranean the new *train-de-luxe* from Calais to the Riviera is booked from Valence to Avignon, 77·3 miles, in 92 min., at an average of 50·3 m.p.h., thus bringing that company within the charmed "50" circle.

Train Loading and Performance.

OUR correspondent, while admitting the truth of the contention in the article that French services are generally slower than British, then proceeds to quote some striking figures in regard to French train-loads. The daily average loading of the 20.10 *rapide* No. 655 last summer from Paris to Evian (Lake of Geneva) was 530 tonnes behind the tender. On the Paris-Orléans line the weight of the 19.10 *rapide* No. 23 from Paris to Bordeaux never falls below 545 tonnes as far as St. Pierre-des-Corps, and 500 tonnes from there to Bordeaux, while the load sometimes rises to 580 tonnes. The train concerned is allowed 1 min. under 8 hours from Paris to Bordeaux, including four stops, which gives an average overall speed of 45 m.p.h. It is interesting to note here that it was intended to reinstate last summer the famous Paris-Bordeaux *rapides*, conveying only first-class passengers, but at speeds equal to the pre-war Sud Express, entailing an average overall speed of 54, and average running speed of 59 m.p.h.; the load allotted to the "Pacifics" of the 3·600 class on this service is to be 500 tonnes, which our correspondent claims will probably involve the hardest express locomotive work in Europe. But the French *Service du Controle de l'État* (corresponding to our Board of Trade) stepped in and forbade the institution of these timings till the relaying and reballasting of the line was complete, which has made it necessary to defer them until next Easter. Our correspondent concludes with a number of timed runs on the État, Orléans and Nord systems, of which considerations of space forbid the reproduction in full, but certain comments of his are worth mention. It is in particular surprising to hear that the new two-cylinder simple "Pacifics" on the Orléans line, although 1½ tons lighter than the corresponding compounds, have proved themselves superior in both performance and maintenance costs, at the expense of practically the same coal consumption per drawbar horse-power. On the trials one of these engines attained a speed of 80·8 m.p.h. on the level with 400 tonnes behind the tender. Our correspondent mentions appreciatively a sustained minimum speed of 40 m.p.h. up a grade of 1 in 190 which he has timed behind one of these engines, with 500 tonnes behind the tender, but allowing for the fact that the French tonne is only 0·98 of the British ton, the sustained 50 m.p.h. with trains of 455 and 475 tons by the new Great Northern "Pacifics" up 1 in 200, recently recorded by Mr. Cecil J. Allen, would be a considerably finer performance. Another remarkable, feat noted by our correspondent was the maintenance by one of the superheated Nord "Atlantics" of a speed of 74·5 m.p.h. continuously for 8·7 miles on a dead level track, between Paris and Arras, with a train of 325 tonnes.

The British Railway Wagon Problem.

MR. H. N. GRESLEY'S paper on "Wagon Stock on British Railways," read before the Institute of Transport on February 5, contains practical suggestions towards the solution of the British railway wagon problem. As has often been pointed out, the most important factor in a wagon for general merchandise traffic is not tonnage capacity but cubic capacity. If instead of our open wagons of about 16 ft. long and our covered wagons of about 18 ft. long, we could introduce a wagon of 24 ft. length, which is the standard for covered wagons in France and on the Continent generally, we should obtain 100 per cent. increased capacity for open wagons and 50 per cent. for covered.

With the smaller number of wagons which would be required to maintain the same total capacity if these dimensions were adopted for general merchandise traffic, Mr. Gresley estimates an annual saving of £548,000 in renewals, which capitalised at 5 per cent. would represent a sum of over £10,000,000. The cost of altering loading docks and enlarging turntables and wagon hoists would, he considers be very much less than £10,000,000, and he suggests that the four grouped companies should make a thorough investigation of the alterations and cost required to enable wagons of this length and capacity to become ubiquitous and generally suitable for ordinary merchandise traffic.

Even if dock owners spent large sums in making hoists suitable for 20-ton or even 50-ton wagons, such wagons would not necessarily be built, because the colliery owner might prefer to continue to use 10 and 12-ton wagons. Mr. Gresley suggests, however, that if wagon hire charges by the railway companies could be adjusted so that there was no advantage to the colliery company in owning its wagons, private ownership would largely disappear.

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MR. T. H. ROYLE, who has been appointed District Superintendent, York, London and North Eastern Railway, joined the North Eastern Railway in November, 1909, as Assistant District Superintendent at Sunderland. He was promoted to be District Superintendent at Middlesbrough in June, 1912, and was transferred to York on January 1, 1923. Prior to joining the North Eastern Railway, Mr. Royle was Traffic Superintendent of the Rohilkund and Kumaon Railway, with headquarters at Bareilly, India.

* * *

THE RIGHT HON. VISCOUNT CHURCHILL, G.C.V.O., chairman of the Great Western Railway Company, is president of the Railway Benevolent Institution for 1923. Sir Herbert A. Walker, K.C.B., General Manager of the Western Section of the Southern Railway, is chairman of the board of management. The sixty-fifth anniversary dinner in aid of the funds is to be held on Tuesday, May 8, at the Hamilton Hall, Great Eastern Hotel, Liverpool Street Station, E.C., when Lord Churchill will preside.

MR. T. H. ROYLE,

District Superintendent, York, London and North Eastern Railway.

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AT a recent meeting of the Irish Railway Clearing House Committee, the Right Hon. Sir William J. Goulding, Bart., D.L., was unanimously elected chairman of the committee for the year 1923.

* * *

LORD CLAUD HAMILTON, for so many years Chairman of the Great Eastern Railway, was presented recently, in the Middlesex Room of the Great Eastern Hotel, Liverpool Street, by Mr. L. Sydney Smith, on behalf of the Staff of the Hotels, Refreshment Rooms and Dining Cars Department, with a silver rose bowl. Lord Claud Hamilton, in acknowledging the gift, mentioned that he had been Chairman of the Hotels Committee for 48 years, which probably constituted a record as Chairman of a Railway Committee. His lordship dwelt upon the tremendous growth of the Department from the time when it consisted only of the Great Eastern Hotel, Harwich.

* * *

MR. E. W. BEATTY, the President of the Canadian Pacific Railway is an optimist as regards prospects in Canada for the current year and business in general as it affects the Company. The following is a message which he has sent to approximately 100,000 officers and employees of the Company: — "To all officers and employees. The record of admirable service maintained by all officers and employees of the Canadian Pacific Railway during the past year has been the source of deep satisfaction to the management, and I desire on my own and on their behalf to express our warm appreciation of it. The New Year opens under auspices more favourable than any since the conclusion of the Great War, and I have therefore all the more confidence that it should prove a happy one for all of you. Our efforts should be directed with ever increasing energy and enthusiasm to the building up of the prosperity of our splendid Dominion, and in

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order that you should contribute in the greatest measure to this prosperity, may you be inspired with courage and hope, filled with contentment and blessed with good health."

* * *

THE RIGHT HON. LORD ASHFIELD was the Chairman on the occasion of a gathering together of the London Underground directors and over 100 members of the company's supervisory staff at the Princes' Galleries on January 29. The object was to hear the reading of six reports by certain officials whom the company had sent abroad to study the traffic transport systems of other cities. Mr. George Watson, Deputy Chairman of the Associated Equipment Company, Limited and Mr. D. E. Batty, Experimental Engineer of the same company, gave papers describing their tours through the United States. These were followed by papers by Mr. A. L. Barber, Commercial Manager, Mr. A. V. Mason, Deputy General Manager and Engineer (tramways), Mr. C. E. Stanier, Civil Engineer, and Mr. J. Thornton, Superintendent of the Line, all of whom had toured Germany, Switzerland and France. Comparisons of the traffic facilities were made and all four papers, which were illustrated with lantern slides, were warmly applauded. The proceedings were then followed by an excellent dinner and an instructive and pleasant evening was brought to a conclusion.

* * *

AT an intermediate meeting of the Railway Club held on January 26, with Mr. B. M. Bazley in the chair, a most enjoyable lecture was given by Mr. M. M. Niven, who took as his subject "The Locomotives of the Glasgow and South Western Railway from 1860 to 1914." For many years Mr. Niven has made a special study of the engines in question, and his remarks were much appreciated by those present. On Saturday, February 10, the club members visited the extension works of the City and South London Railway.

* * *

FOUNDED in 1854, the Great Northern Railway Literary Society still carries on its useful work It is open to all grades of the clerical staff, and at present possesses nearly 1,000 members. The advantages it offers are:—a library of over 6,000 volumes; the leading newspapers, periodicals and magazines, a large billiard-room with four full-sized tables, a reading and tea-room, a chess and draughts room. Once a year the society blossoms forth in the public eye and that is on the occasion of its annual smoking concert. From the year 1898 this has always been held at the Queen's Hall, Langham Place, London, W.C., and it has been invariably a great success. The thirty-second concert—the first took place in 1887—held on February 9, under the genial chairmanship of Mr. G. F. S. Bowles, was no exception to the long established rule. As in many former years Mr. H. Jude was chairman of the concert committee, and Mr. F. Y. Marrian, with the assistance of Mr. H. S. Brush, was hon. secretary. The object of the concert is to afford an opportunity for meeting of members of the Society and staff, and their friends, and every effort is made by the committee to provide a high-class programme which may meet the requirements of those who prefer a bright variety entertainment as well as those who demand music of a more classical order. The committee succeeded admirably in each direction. With the aid of the management of the Coliseum, Victoria Palace and Messrs. Maskelyne's a splendid programme was presented, and the various items by talented artistes received the emphatic approval of the great audience. In the course of the evening Mr. G. F. S. Bowles mounted the platform and after an exceedingly cordial reception, made a very eloquent and appropriate speech. As a Great Northern director, he had that morning attended the last board meeting that would be held referring to that company which was now merged into the London & North Eastern Railway. Mr. Bowles spoke feelingly of Great Northern traditions and the great reputation of the line. He wished them all "good-bye and good-luck," and he assured them that the Great Northern, in the great grouped railway of which it now formed part, would not be one of the least distinguished members.

* * *

ON February 12 a representative gathering of pressmen assembled at the Cannon Street Hotel for the purpose of making a presentation to Mr. A. E. Dixon, on his retirement from the Publicity Department of the S.E. and C. Railway. Mr. J. G. Locks, who presided, handed Mr. Dixon a gold cigarette case, bearing the inscription:—"Presented to A. E. Dixon, Esq., on his retirement from the S.E. and C. Railway, as a mark of esteem from his many press friends, December, 1922." He also asked Mr. Dixon's acceptance of a cheque. Mr. Locks expressed the hope that the gift would help Mr. Dixon to remember his friends of the press in the years of his retirement.

* * *

AT a dinner of stationmasters and agents, London, Brighton and South Coast Railway, Sir William Forbes, General Manager, said he by no means regarded the occasion as a funeral feast. He did not believe that any

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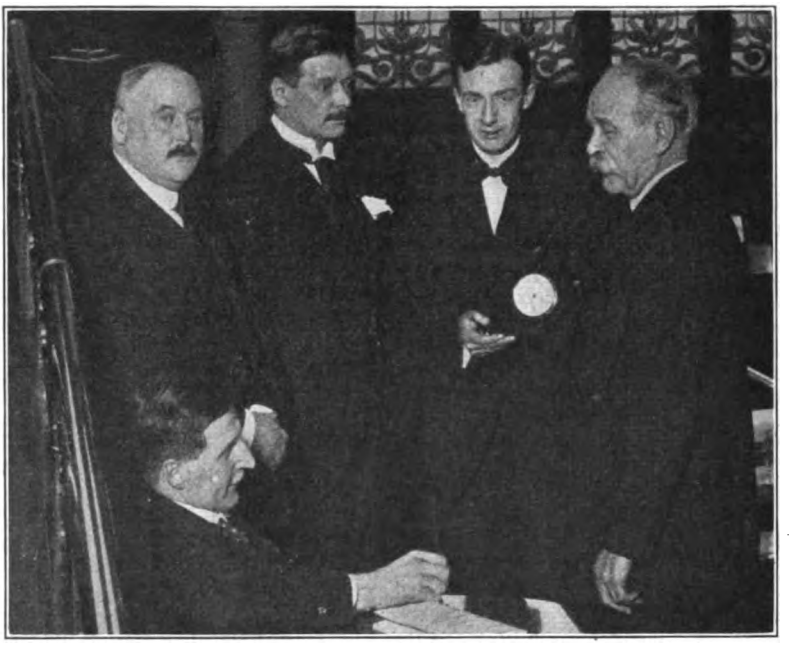
grouping of the Southern systems could wipe out the traditions of the Brighton Railway. Notwithstanding all that the evangelists of standardisation and centralisation might do, the Brighton system would retain its distinctive characteristics. As to his personal connection with the new Southern Group, he realised that after half a century of strenuous work in the railway world, he could not undertake the heavy responsibility in such a large combination; but he came of an old railway stock—his father was a manager at 32 years of age and his uncle, James Forbes, was one of the railway kings of the Victorian era—and he hoped to continue his association with the old Brighton line, the staff of which he regarded as a family party. Touching on this domestic side, he might confide to his friends that he believed the link would be cemented by his infant son, who, although only two years and ten months old, aspired to be an engine driver. His greatest delight was to play with a beautiful working model of an engine on the Brighton Railway.

* * *

At the third annual general meeting of the English Stockholder's Protection Association on February 1, a small committee, consisting of the Chairman, Sir Charles Wakefield, Mr. E. M. Rodocanachi, Mr. W. J. Stevens, Mr. G. H. Hargreaves and Mr. A. W. Burchell (the secretary), was appointed, to constitute a committee to be nominated by the Scottish Association to prepare a scheme for the closer working or union of the two associations.

* * *

Railwaymen from all parts of the Western Division of the London Midland and Scottish Railway assembled at the Albert Hall, Manchester, on January, 29, on the occasion of the distribution of prizes and certificates awarded in the examinations held in connection with the London and North Western Railway (Northern Division) School of Signalling during the 1921–22 session. The awards were presented by Mr. E. B. Fielden, a deputy chairman of the London Midland and Scottish Railway. Mr. Ashton Davies, General Superintendent (Western Division), occupied the chair, and was supported by Mr. J. H. Follows, Chief General Superintendent; Mr. G. Hughes, Chief Mechanical and Electrical Engineer; and Mr. T. M. Royle, Assistant General Superintendent



Photo] [*E. Hulton & Co. Ltd.*

LONDON MIDLAND AND SCOTTISH RAILWAY (WESTERN DIVISION) SCHOOL OF SIGNALLING PRIZE DISTRIBUTION.

Left to right.—Mr. J. H. Follows, Chief General Superintendent; Mr. Ashton Davies, General Superintendent (Western Division); Mr. J. Newall, General Superintendent's Office, Manchester; Mr. E. B. Fielden, Deputy Chairman.
Seated.—Mr. G. Hughes, Chief Mechanical and Electrical Engineer.

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(Western Division). Sir Edward Stockton, M.P., a director of the London Midland and Scottish Railway attended for a short time. Opening the proceedings, Mr. Ashton Davies said that the school was an institution of which everybody in the north was proud, and last year was the crowning point in its history. Altogether 1,473 students were handled, and of the 574 who sat for the examination, no fewer than 552, or 96 per cent., passed.

* * *

MR. JOHN BAGWELL, Senator, General Manager of the Great Northern Railway of Ireland, was kidnapped by a party of armed men whilst walking home from Sutton railway station, but subsequently escaped from a house near the borders of County Meath.

* * *

RESPONDING to the toast, " Success to the Great Western Railway," at a dinner of the Newport Division and Docks Civil and Mechanical Engineering staff, Mr. J. H. Vickery, J.P., said the Great Western was singularly fortunate in having retained its identity and its name. The public and the railway service could look forward to a time of great progress. It was a mistake to think that, since the grouping took place, competition had been eliminated. There was going to be higher competition—a competition of service and of facilities—which would make for progress, and it was up to the men in the service to see that they were not left behind.

* * *

THE British Industrial " Safety First " Association, of which Mr. H. E. Blain, Assistant Managing Director, London Electric Railway, etc., is the hon. secretary, held its annual meeting at the Caxton Hall, Westminster, on February 16, followed by a dinner at the Trocadero Restaurant. Lord Armstrong has consented to become the President for the year 1923, in succession to Viscount Leverhulme.

* * *

MESSRS. R. AND W. HAWTHORN, LESLIE AND CO., LIMITED, locomotive builders, Newcastle-upon-Tyne, have opened a new office in Westminster at 3A, Dean's Yard, S.W. 1. The firm's office in the City of London at Exchange Chambers, 24, St. Mary Axe, will continue as heretofore.

* * *

THE Ministry of Transport makes the following announcement: The Railway Companies made application for an extension to June 30, 1923, of the time for submission of schedules of the proposed standard charges under the provisions of Section 30 of the Railways Act, 1921. After very careful inquiry and consideration of all the circumstances the Minister has agreed to the application on the understanding that the Railway Companies will submit the schedules by June 30, without fail, and that they take every possible step in their power with a view to an earlier submission.

* * *

THE Minister of Transport has recently made the undermentioned order :—The Festiniog Railway (Light Railway) Order, 1923, authorising the Festiniog Railway Company to work and maintain the railway authorised by the Festiniog Railway Acts of 1832, 1838 and 1869, as a light railway under the Lights Railways Acts, 1896 and 1912, as amended by the Railways Act, 1921, and to construct light railways at Portmadoc forming a junction with the Welsh Highland Light Railway and to construct a new station in substitution for the present Portmadoc station of the Company and amending the borrowing powers of the Company and for other purposes.

* * *

THE London Underground Railways have placed a contract with Messrs. John Butler & Co., of Leeds, for five bridges on the Edgware and Hampstead Extension line now in the course of construction. Two of these bridges will cross Highfield Avenue and Shirehall Lane. The amount of the contract is £8,432 Another contract amounting to £757 has been placed with Messrs.E. C. & J. Keay, Limited, of Birmingham for a bridge to carry the line under Colindale Avenue. All six bridges are to be completed in 20 weeks. A further contract for £34,865 has been placed with Messrs. Waygood Otis, Limited for four escalators to be installed on the City and South London Railway, two at Clapham Common and two at Stockwell. The total cost of the above new works thus amounts to £44,054.

* * *

Two additional six-car trains of the pneumatic door type have been put into service on the Piccadilly Line. This modern type of rolling-stock has met with much public favour, affording as it does 65 ft. of doorway accommodation, as against 25 ft. in the older type of car. Apart from the advantages these new cars possess in relieving congestion both in the train and on the platform, the customary noise from the slamming of doors and gates and the ringing of bells and whistles is also abolished. The pneumatic doors close silently and, on closing, automatically give to the driver a

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visual signal. The train then moves away noiselessly and quicker than the old type of rolling-stock.

* * *

ACKNOWLEDGING indebtedness to "The Why and the Wherefore" section in recent numbers of the RAILWAY MAGAZINE, Mr. A. Miall writes that he has obtained information in regard to the Monmouth and Coleford line and Bearley and Alcester branch, Great Western Railway. On the former the rails have been taken up between Wyesham Junction and Coleford, though the station at the latter place appears to be used for run-round purposes by Severn and Wye trains. In the case of the Bearley and Alcester branch, points and signals for the branch have been removed at Alcester Junction. Between Great Alne and Bearley, on the occasion of Mr. Miall's visit, relaying was in progress, and at Bearley North Junction the line looked quite normal, except that all signals for the Alcester branch were marked with a cross, showing that they were not yet in use.

* * *

As from February 1 the railways have agreed to charge machinery (complete or in parts—with certain exceptions) exceeding 2 cwt. per piece or package when consigned at owner's risk and conveyed in the guard's van, at the owner's risk scale of rates, subject to special and prior notice being given when such consignments require to be forwarded. The owner's risk scale of rates will, therefore, be applicable to machinery, irrespective of weight (with certain exceptions), when consigned at owner's risk and conveyed in the guard's van.

* * *

OWNERS of model railway locomotives are informed by Messrs. Vernon Smith, Limited, 105–123, High-road, Chiswick, that they are willing to consider exchanges, this being in fact, one of the features of their business. They have just increased very largely their stock of new and second-hand model locomotives.

* * *

COMMENTING upon several references to the working of through trains between the Great Western Railway and the Great Central section of the London and North Eastern Railway, Mr. C. R. Clinker writes from Rugby stating that "since Monday, January 15, the 9.5 p.m. Swindon to York has been drawn by a Great Western Railway engine from Swindon to Leicester. The return journey is the 10.3 p.m. York to Bristol, from Leicester to Swindon. The engine at present employed is No. 3809, *County Wexford*, driven by Great Western Railway men with a Great Central Railway pilotman. No. 3809 is stationed at Swindon. The 7.30 a.m. Swansea to Newcastle is also worked by a Great Western Railway engine from Swindon to Leicester, returning to Swindon on the 9.30 a.m. Newcastle to Swansea. The engine at present working this service is No. 5354 (2-6-0). Much use has been found for the new Great Central 4-6-0 outside cylinder locomotives built in 1922. Three of these engines (Nos. 467, 468 and 469) are stationed at Woodford shed, and are now working the 7.35 a.m. Southampton-Newcastle train from Banbury to Sheffield, returning to Banbury on the 3.0 p.m. York-Southampton. Another "turn" that is frequently worked by these engines is the down Penzance-Aberdeen from Banbury to Leicester, returning on the up Aberdeen-Penzance to Banbury."

* * *

IN response to an inquiry from Mr. E. Little, our Crewe correspondent, Mr. C. Williams, states that compound locomotive No. 1976, *Lady Godiva*, was scrapped in December last, and two others, No. 1908, *Royal George*, and No. 1956, *Illustrious*, were scrapped in January. It is said that the names *Lady Godiva* and *Illustrious* will be perpetuated on engines of the unnamed "Claughton" class. Our Crewe correspondent adds that the days of the remaining 4-4-0 compounds of the "Jubilee" and "Alfred the Great" classes are "more or less numbered" and a similar remark may be made in regard to the two-cylinder simples of the "Renown" class, although many of these will be at work for some time.

* * *

OUR Crewe correspondent, subsequently to his remarks in the above paragraph, writes:—The first of the new 0-8-4 shunting tank engines is now in hand at Crewe, No. 380. A further two will also be put in hand shortly, Nos. 782 and 1189. No. 806 *Swiftsure* ("Precursor" class) has been converted to "George the Fifth" class, and is now stationed at Monument Lane, Birmingham. Two further 4-4-0 compounds have been withdrawn from service, viz., No. 1956 *Illustrious* and No. 1908 *Royal George*. The name *Illustrious* will shortly re-appear on an engine of the "Claughton" class. The locomotive stock of the late North London Railway is being renumbered in the nominal list of Division "A"—the passenger engines from 2800 to 2874 and the goods from 2875 to 2896, both inclusive. No. 1664 is the latest four-cylinder passenger engine to be turned out at Horwich. The 0-6-2 tanks Nos. 264 and 279, which recently came to Crewe for repairs, are now stationed at Poplar. One of the Midland singles, No. 600, has paid several visits to

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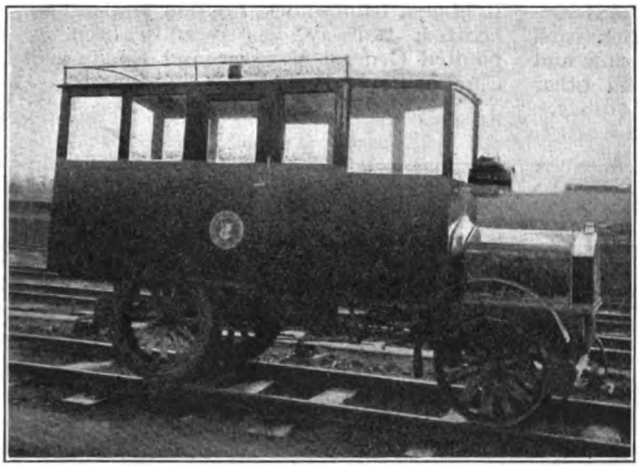
Crewe recently, attached to one of the official saloons.

* * *

WRITING from York, on February 1, Mr. C. Ord remarks :—Considerable interest was aroused here yesterday by the appearance in the Old Station Carriage sidings of the following locomotives, which, although retaining their company colours and numbers, were lettered L. & N.E.R. on their tenders :—

N.E.R., 4-4-2, Class Z, No. 2169.
N.E.R., 0-8-0, Class T.2., No. 2237.
G.N.R., 4-4-2, " 251 " class, No. 1418.
G.N.R., 2-8-0, No. 484.
N.B.R., 4-4-2, *Dunedin*, No. 874.
G.C.R., 4-6-0, Express goods, No. 474.
G.C.R., 4-4-0, *Somme*, No. 503 (" Director " class).
G.C.R., 4-6-2T., No. 451.

The initials L. & N.E.R. surmounted large numbers on the tender sides.



AN IRISH RAIL MOTOR CAR.

This car belongs to the County Donegal Railways Joint Committee.

BY the courtesy of Mr. H. Forbes we are able to illustrate an Irish rail motor car that has been in use on the County Donegal Railways for a number of years for inspection purposes and occasionally for the conveyance of urgent mail traffic, and which has given very satisfactory results. The car is fitted with a " Ford " engine, and is capable of carrying seven passengers at a speed of 35 m.p.h. on this line, which is a 3-ft. gauge.

* * *

" Norwest " mentions that some interesting exchanges of rolling-stock have been made on the London Midland and Scottish Railway, instancing a late Lancashire and Yorkshire Railway five-coach restaurant car set which has been working from London Road, Manchester, to Euston on the 9.45 a.m. train, returning on the 4 p.m. from London, and a Midland six-coach restaurant car set on the 12.5 p.m. from Manchester (London Road) to London, returning on the 5.35 p.m. from Euston, travelling via Stoke. There will, no doubt, be many other instances of this kind between railways in all groups.

* * *

PASSENGERS dining on the 5.30 p.m. Liverpool express from Euston on February 6, listened-in to news bulletins picked up by an " inside " aerial fitted in the train by Marconi experts. Concerts and even the voice of an amateur transmitter were heard during the journey. London was picked up about 50 miles out, and Birmingham later.

* * *

EXCURSIONS of pre-war type will be the feature of the Easter announcements by the four great railway groups. Cheap bookings from London to all parts, and from the Provinces to London, will be given ; also to and from Scotland, Ireland, and the Channel Islands. Facilities for return will be extended generally for a fortnight from the date of the outward journey, and week-end tickets will be available for return up to the Tuesday instead of the Monday. Other features will be a number of cross-country excursions from Scotland and the Northern and Midland Counties to the West of England and South Wales, while facilities from the same districts to south coast and other resorts via London will be given. The whole of the excursion fares will be cheaper than last Easter, a general reduction of one-seventh being made. Tickets for day and half-day excursions will be issued at single fare for the double journey, and in the case of longer periods at single fare and one-third.

* * *

RECENTLY rumours were current in France pointing to the possibility of the Newhaven–Dieppe and Boulogne–Folkestone routes being abolished as a consequence of the new arrangements made for uniting the southern railways in England in a single " Group," the Dover–Calais route being alone maintained. The Municipal Council of Dieppe investigated the matter, and from statements made by

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M. Rimbert, Mayor of Dieppe, and M. Thoumyre, President of the Chamber of Commerce, it appears that the Newhaven–Dieppe line cannot be abolished before 1934, the contract between the London, Brighton and South Coast Railway and the Chemin de Fer de l'Etat extending until that date.

* * *

A MEETING of the Dearne Valley Light Railway Committee, consisting of representatives of the Wombwell, Wath-upon-Dearne, Bolton and Thurnscoe Urban Councils, was lately held at Wombwell, when it was decided to accept the tender of the Consolidated Construction Company for the construction of a light railway between Barnsley and Manvers Crossing, including the districts of Wath-upon-Dearne and Thurnscoe, at an inclusive figure of £200,243.

* * *

THE Swiss Federal Railway Administration has been making trial runs on the Berne-Thoune line with new electrical motor cars. The cars are to be used for local traffic and later on for suburban traffic round other towns. The trial runs proved very satisfactory. The maximum speed of 75 km. per hour was reached after a run lasting only 34 seconds.

* * *

FORMERLY a first-class traveller in a German sleeping car was accommodated with an entire compartment containing two berths, while a second-class traveller was entitled to one berth in the same kind of compartment. This arrangement was altered as from February 22, and travellers now have to pay the full first-class fare and a sleeping car supplement for only one berth.

* * *

MR. R. H. WHITELEGG, whose portrait appears on another page, and who, from July, 1918, to December 31, 1922, occupied the position of Chief Mechanical Engineer, Glasgow and South Western Railway, and has since January 1, 1923, been Mechanical Engineer, Kilmarnock, London Midland and Scottish Railway, has recently been appointed General Manager and Engineer-in-Chief of Beyer Peacock & Co., Limited.

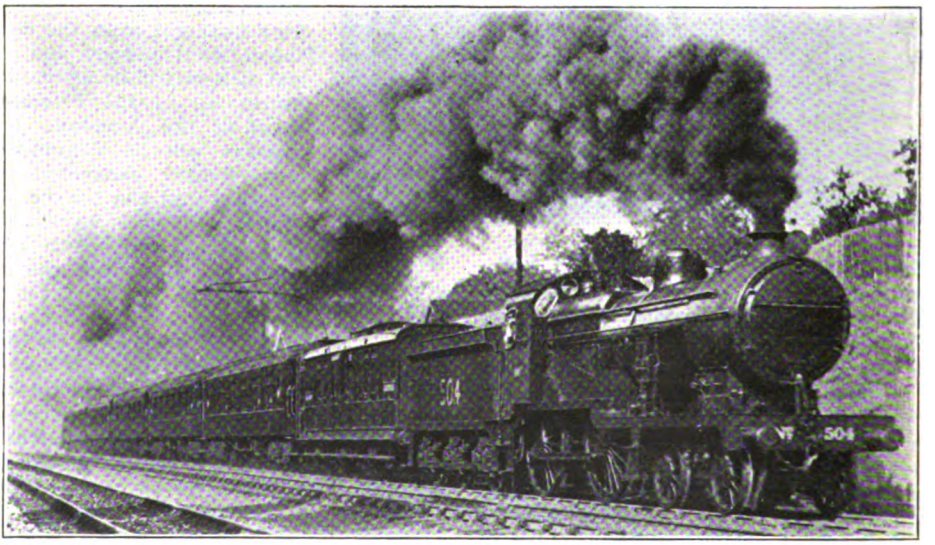

Photo.] SOUTHERN RAILWAY. [*F. E. Mackay.*

"Thanet Limited" Pullman Express.
South Eastern and Chatham Rebuilt 4-4-0 locomotive No. 504.

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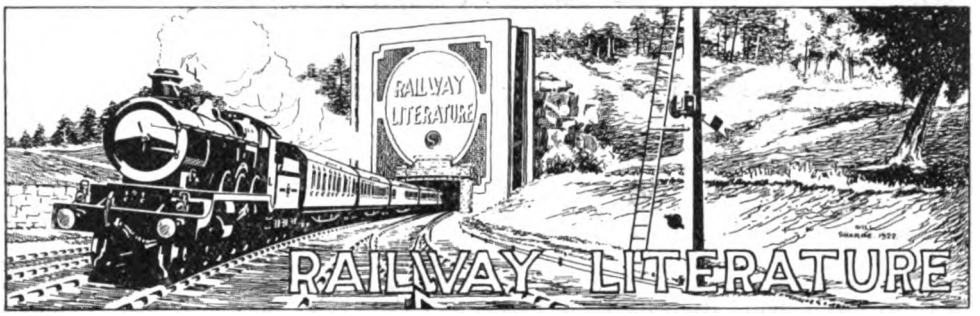

THE BIRTH AND EARLY DAYS OF OUR AMBULANCE TRAINS IN FRANCE, AUGUST, 1914. By Colonel G. A. Moore, C.M.G., D.S.O., M.D. [John Bale, Sons & Danielson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W.1. Price 1s. net.; by post, 1s. 2d.]

This booklet, now in a second edition, written by the Deputy Chief Commissioner of the St. John Ambulance Brigade, is dedicated to "The R.A.M.C. Regulars, Special Reserve and Territorial Army, and to the members of the Order of St. John of Jerusalem, the British Red Cross, and kindred societies, who made and manned the ambulance trains in which tens of thousands of the splendid sick and wounded of Great Britain, Ireland, and Overseas were carried in comfort and safety to the Base." The purpose of this booklet is best described by a quotation from the author's "afterword." He points out that it is often asked when and from what source did we get our ambulance train service in France at the beginning of the war. "This story is written to answer these questions and recall times of stress and fine work to many of the hundreds of the Royal Army Medical Corps (Regulars and Volunteers), members of the Order of St. John of Jerusalem, the British Red Cross and kindred organizations, to whom the care and carriage of our splendid sick and wounded were entrusted in the early days of the Great War." Several photographs are reproduced, and useful and interesting information is contained.

RAILWAY AMALGAMATION STOCK TABLES UP TO DATE. By K. S. Drewe. [Effingham Wilson, 16 Copthall Avenue, E.C.2. Price 1s. net.]

This little pamphlet is designed to supply a number of tables showing all possible percentages of new stock with the proportional equivalents on small amounts. The information given will, no doubt, prove of great value in connection with the conversion of railway stocks under published terms of fusion.

JOURNAL OF THE PERMANENT WAY INSTITUTION. The December number in addition to reports of sectional and other meetings, contains the following papers: "Construction of Tube Railways," by H. H. Dalrymple Hay, M.Inst.C.E.; "Renewal of Bridges," by B. P. Fletcher, M.Inst.C.E.; "Construction of Roads," by H. W. Bryant; "Out of Gauge Loads and Construction Gauges," by T. Appleyard; and "Sierra Leone Government Railways," by J. L. Poxon. Further particulars can be had from Mr. E. Treacher, Hon. Editor, "Harcourt," North Road, Woking, Surrey.

RAILWAY RATES TRIBUNAL: Jurisdiction and Practice. By G. Garro Jones, of Gray's Inn, Barrister-at-Law. [Palethorpe & Cond, Limited, London and Birmingham. Price 10s. 6d. net.]

This book deals with the extensive powers invested in the Railway Rates Tribunal by the Railways Act, 1921. The powers given to this court to determine merchandise rates, passenger fares and conditions of carriage, affect not only the commercial community but the public in general, and the railway companies very directly. The book should prove a useful guide both to them and to their legal advisers.

BARTHOLOMEW'S RAILWAY MAP [John Bartholomew and Son, Limited. Duncan Street, Edinburgh. Price 5s. net.]

In this map of the railways of the British Isles the grouping that has resulted from the operation of the Railways Act, 1921, is clearly demonstrated. Each group of railways is distinguished by a separate colour and joint intergroup lines are shown by alternating colours of the groups concerned. The map under notice is mounted on cloth and folded, but it may also be obtained mounted on cloth, rollers, and varnished, as a wall map at 10s. net., while a cheap edition on paper only, folded, is sold for 2s. 6d.

THE MECHANIC'S FRIEND. By Archibald Williams, B.A. [Thomas Nelson & Sons, Limited, London, Edinburgh and New York. Price 7s. 6d. net.]

The purpose of this volume is to give information of a practical kind in connection with the working of metal and wood, hydraulics, electrical apparatus, tools, machinery and kindred subjects. By

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judicious selection of his material the author has succeeded in presenting it in such a way that the book will be of great value to a vast number of readers. In fact, the book is a mine of useful information for those who are engaged in, or interested in mechanics, and much painstaking care has been expended in ensuring the accuracy of the letterpress and the drawings by which it is illustrated. Bound in cloth, it contains upwards of 400 pages full of hints, suggestions, recipes and instructions on a wonderful selection of subjects.

THE WRINKLE BOOK. By Archibald Williams, B.A. [Thomas Nelson & Sons, Limited, London, Edinburgh and New York. Price 7s. 6d. net.]

A book such as this, to which one may turn in an emergency has its uses, particularly to persons who have not access to an extensive library. It does not claim to be an encyclopædia, saying something about everything, but all the same, it contains a vast amount of information and instruction in regard to mechanics, the workshop, entertainments, sports and other living interests, and it incorporates a considerable amount of matter that could not easily be found elsewhere. Bound in cloth it contains over 500 pages and the latter carry no fewer then 275,000 words. Liberally illustrated by diagrams and sketches, the book is really extraordinary good value for the money asked for it.

RAILWAY STOCK CHANGES UNDER THE RAILWAYS ACT, 1921. [Effingham Wilson, 16, Copthall Avenue, London, E.C. 2. Price 1s.]

To the question, "If I hold £100 of any home railway stock, what do I receive in exchange?" this pamphlet provides the answer, so far as it is at present possible in regard to the railways amalgamated or absorbed in any of the four great groups set up under the Railways Act, 1921. When amalgamation and absorption schemes are all completed a new edition will be brought out, but in the meantime the booklet furnishes much useful information.

THE RAILWAY GROUPING SCHEME. By Vernon Sommerfield. [*The Financial News*, 111, Queen Victoria Street, London, E.C. 4. Price 1s. net.]

Intended as a handbook for stockholders and investors, the author, in addition to providing facts and figures, has set forth succinctly what railway grouping means to shareholders. In regard to grouping economies he warns the shareholder not to expect too much for an appreciable time to come. The total amount of directors' fees and expenses for the whole of the railways of Great Britain was under £190,000 in 1921, a sum so trifling in comparison with the expenditure that year (over £256,000,000) that the receipts of any individual company would hardly be affected if the whole of the amount were saved. Economies should eventually be obtained on the operating side. There is considerable scope for the standardisation of locomotives, rolling-stock, signals and other equipment, including electrical equipment. Alternative routes and other points are dealt with by Mr. Sommerfield. He likewise expresses the view that grouping will mean a much freer market in railway securities. Useful as the handbook will be to the railway shareholder, there is no doubt it will find appreciation among those who study railways and railway problems from the point of view of the person commonly known as the *railwayist*.

RAILWAY MAP OF THE BRITISH ISLES. [George Philip and Son Limited, 32, Fleet Street, London, E.C.4. Price 2s. 6d. net.]

This map, size 33 by 42 in., scale 18 miles to the inch, is printed on paper, folded in case. It shows by distinctive colours the four great new British railway groups. A useful feature is that the identity of the various original systems has been preserved. The new groups and their component systems are distinguishable at a glance. Every railway station of importance is named. Inset maps are given of the principal industrial areas. Steamship routes with distances and duration of passages are shown. The same map, mounted on cloth and folded in cover, is priced 5s. 6d. For mural use it is supplied mounted on cloth and varnished, with rollers, for 7s. 6d.

SOUTH WALES SAILING LIST. [Published by the Great Western Railway.]

First published for December, 1922, this is, apparently, to be a regular monthly issue, giving, in convenient booklet form, particulars of sailings from the South Wales ports, Newport, Cardiff, Penarth, Barry, Port Talbot and Swansea, now under the direction of the Great Western Railway, together with statistics as to dock accommodation, transit sheds and cold stores, tide tables, tonnage rates on vessels, and wharfage rates on goods. Included are telephone numbers and telegraphic addresses, together with the names of the chief officers, while the information given will, no doubt, be of great value to manufacturers and merchants interested in the export trade. Illustrations are included. Copies can be had on application to the Chief Docks Manager, Great Western Railway, Bute Docks Offices, Cardiff.

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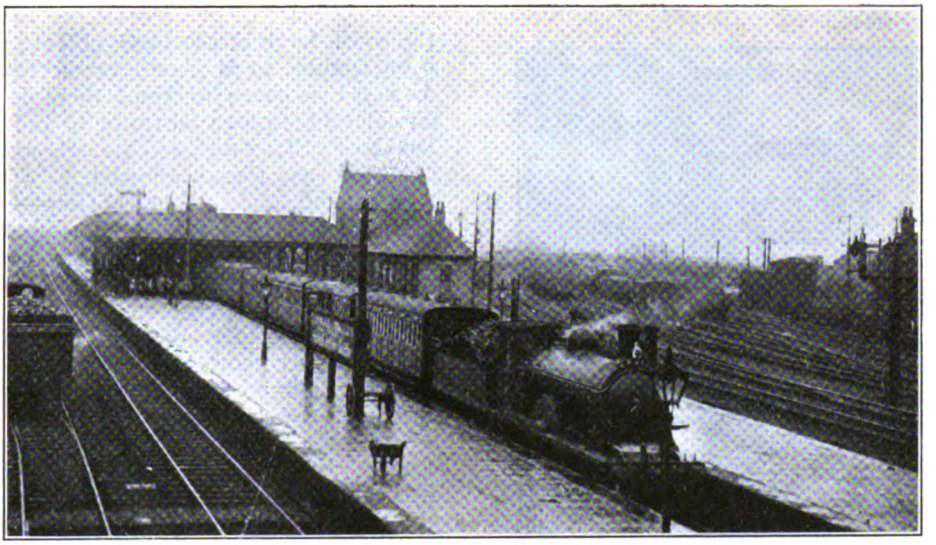

THORNTON JUNCTION.
Crail branch train in northern terminal bay.

The Fife Coast Lines of the London and North Eastern Railway

(NORTH BRITISH SECTION).

By J. F. GAIRNS.

IT is somewhat remarkable that although Fife is one of the most industrially important, after Lanark and Edinburgh, of the Scottish counties, and is well populated in all parts, yet every mile of its considerable public railway mileage was owned or operated by the North British Railway, now included in the Scottish Area, London and North Eastern Railway. Included are several important sections, notably part of the Edinburgh-Aberdeen main line between the Forth and Tay Bridges, and part of the Edinburgh-Perth main line, together with the network of lines around Dunfermline and centreing upon Thornton Junction, many associated with the extensive Fife coal industry. There are also several interconnecting lines, and country branches of local importance, and a number of others concerned with residential and holiday and tourist traffic, while in all parts, whether coal is a principal traffic or not, there is considerable agricultural and a fair amount of industrial traffic.

Between the north end of the Forth Bridge and Thornton Junction, the Edinburgh, Dundee and Aberdeen main line skirts the coast, and on this section are several places of historic, tourist and holiday interest; notably, Inverkeithing, Aberdour, Burntisland and Kinghorn. The "lang toun" of Kirkcaldy, with the neighbouring municipality of Dysart, are served by three stations, Kirkcaldy, Sinclairtown and Dysart, but here industry is mainly concerned, though Kirkcaldy is to some extent a shipping port and the harbour has a connecting line. Burntisland is an important coal-shipping port, with some general shipping traffic, and is also a popular holiday resort, along with its neighbours Kinghorn and Aberdour.

At Thornton, in addition to landward branches, the Methil and Fife Coast lines diverge to follow the coast of "the ancient Kingdom of Fife" round the "Neuk of Fife" to St. Andrews and thence to Dundee. In the north is the Tayport loop, serving the favourite residential districts on

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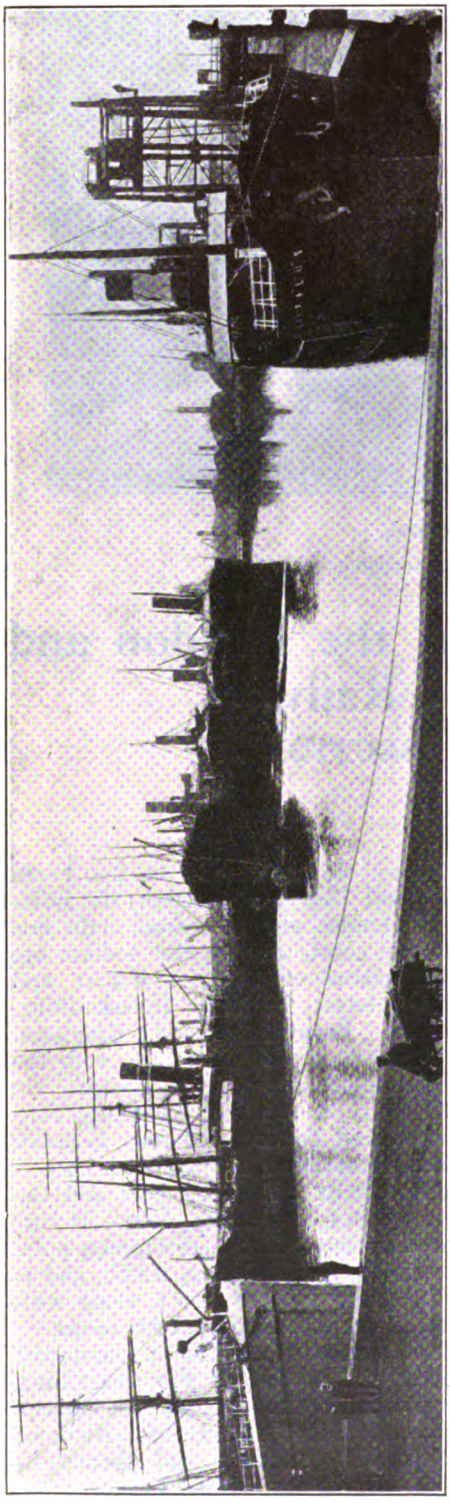

GENERAL VIEW IN METHIL DOCKS.

the south bank of the Firth of Tay, while from Dundee to St. Andrews *via* Tayport or *via* Leuchars Junction, there is also considerable residential traffic to and from Dundee. St. Andrews, though usually regarded as the headquarters of the "Royal and Ancient Game of Golf," is also a University town and leading scholastic centre, besides being a recognised holiday resort known all over Scotland and largely visited from England.

These coast lines possess considerable interest, and they are, moreover, concerned with important traffic. Coal figures largely in the southern parts of Fife, and as far as Leven and Methil round the coast. Industrial traffic is found at Kirkcaldy, and shipping traffic there and at Burntisland and Methil. Holiday traffic centres upon Aberdour, Kinghorn and Burntisland, and round the coast line from Leven to Crail, and to some extent on the Methil branch. Golf is an important consideration, and several popular courses are associated with places served by the coast lines. Edinburgh and Glasgow residential traffic is also considerable, not only to and from places south of Thornton but also round the coast to Anstruther and Crail, while to the north several places are favoured for residential purposes by Dundee business people.

Until the completion of the first Tay Bridge in 1878, and necessarily from December 28, 1879, until the second bridge was opened for traffic, the main route from Edinburgh was from Burntisland (ferry from Granton) to Leuchars Junction and thence to Tayport (ferry across to Broughty Pier), but otherwise the main line was substantially complete some years before, though the erection of the Forth and Tay Bridges has increased its importance as a traffic route to an almost immeasurable extent.

The Edinburgh and Northern Railway, which, when amalgamated with the Edinburgh, Leith and Granton Railway, became in 1849 the Edinburgh, Perth and Dundee Railway, was responsible for the construction of the main line from Burntisland to Ladybank Junction, where a branch line gave connection *via* Newburgh to Perth, and to Cupar and Ferry-Port-on-Craig (Tayport). This route was completed throughout in September, 1847. There were also the branch from Thornton to

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Dunfermline and the Kirkcaldy Harbour line. In 1862 the original North British, Edinburgh, Perth and Dundee, and other lines were amalgamated to form the late North British Company, and most of the other lines now concerned relate to subsequent developments, amalgamations, &c.

Under the Tay Bridge Act of 1870, the present main line from Leuchars Junction was authorised. The St. Andrews Railway from Leuchars Junction was made by a separate company (incorporated 1851) and worked by the North British Company until amalgamated in 1877. The connecting line from Burntisland westward to Inverkeithing, there joining the Queensferry and Dunfermline line (incorporated 1873, amalgamated 1877), was completed and opened on June 2, 1890. The Leven Railway, incorporated 1852, from Thornton Junction to Leven, was opened August, 1854. The East of Fife Railway, incorporated 1855, extended this line to Kilconquhar, opened August 17, 1857. These two companies were amalgamated in 1861. The Leven and East of Fife line was extended to Anstruther in 1861, the company being also authorised to make a connection from Cameron Bridge to Methil, thus providing the present principal coal traffic access to the Methil docks. In 1877 all these companies were vested in the North British. The Wemyss and Buckhaven line, incorporated in the present Methil branch from Thornton Junction, was purchased from Mr. R. G. E. Wemyss in 1889, together with the Methil and Leven docks and the Leven Harbour line. Modern extensions and developments at Methil are covered by Act of 1907. The Anstruther and St. Andrews line was authorised in 1883, opened in 1887 and taken over in 1897. The Newport Railway, from Tayport to Wormit, at the south end of the Tay Bridge, was opened May 13, 1879, being amalgamated in 1900. In that year the Kirkcaldy and District line was also taken over. In 1900 Methil New Dock was opened, and in 1902 the docks at Burntisland were similarly extended.

Commencing in the south, at the north end of the Forth Bridge, the line now traversed is, as far as Inverkeithing, largely new construction associated with the erection of the famous bridge. The old line, at a lower level, leads down to North Queensferry pier, whence a ferry steamer still plies across the Forth to South Queensferry. The branch also gives access to Rosyth Dockyard, and though no ordinary passenger trains use it, workmen's and other trains are run as required, together with goods and coal trains. The line is here steeply graded, with sharp curves, rock cuttings and several tunnels. The traveller has occasional views over the rocky coast, protection works, and Inverkeithing Harbour. At Inverkeithing the Perth route diverges, the main-line proceeding eastwards to Aberdour, where it is again in view of the coast. Aberdour is a favourite resort, with fine sands and holiday attractions, while it is adjacent to country having much historic interest. Beyond the station the line is close alongside the sea, though at a higher level, and splendid views of " rocky coast and silvern sand " are had on the run to Burntisland. Here the line cuts across the neck of a peninsula, the westward side being the resort of holiday visitors, while on the east are the Burntisland docks, alongside the passenger station.

It will be remembered that until the Forth Bridge was completed the North British Railway route to the north included ferry from Granton to Burntisland, the rail journey to the north being recommenced at Burntisland. This ferry at one time conveyed railway wagons. It is still operated, but without this feature. The ferry steamers use the ferry slip in the old harbour. Alongside the passenger station, but on a lower level, are the old station premises, somewhat imposing, though now all used as offices and for various purposes. The lower level lines ascend to reach the present main line a little to the east of the passenger station. Extensive sidings are provided, giving access to the dock lines and so to the coal tips in the new and old docks, and round the bend alongside, but on a lower level, as the main line curves round the headland, are storage sidings.

Burntisland docks are owned and worked by the railway company. The harbour is easy of access in normal weather, and there is a good roadstead in front of the tidal harbour. The docks are enclosed by piers, with an entrance 250 ft. wide. The Old Dock has an area of 5½ acres,

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HARBOUR ENTRANCE, WEST DOCK, BURNTISLAND.

while the newer East Dock has an area of 11½ acres. Quayage totals about 1,900 ft. Vessels up to 6,000 tons can be dealt with at Burntisland, and the dock equipment includes six modern hydraulic hoists and four hydraulic cranes, the power for which is supplied from the railway company's power station, situated mid-way between the two docks. The export of coal is the principal factor, and as much as 2½ million tons have been shipped per annum, but considerable inward cargoes arrive, consisting of ore for the large aluminium works close at hand, cork-wood, esparto, linseed, wood-pulp, &c. Shed and wharfage accommodation exists at the docks capable of storing 1,500 tons general merchandise. Coal generally arrives by rail from the Fife coalfield. Three locomotives are usually engaged in shunting traffic in the docks at Burntisland while another is generally required at night and is utilised as occasion demands to assist up goods trains in view of the severe gradients.

The Northern District Operating Superintendent's offices, under Mr. D. McRobbie, are at Burntisland, his premises also accommodating the Northern Control offices. These are generally designed and operated as described in the January, 1922, RAILWAY MAGAZINE.

Leaving Burntisland, a favourite holiday resort, with splendid sands, holiday attractions, and a fine golf course, as well as a coal shipping port and shipbuilding centre, the main line skirts the bay and then cuts across to Kinghorn, another place held in high esteem by holiday visitors. There are many places of historic interest in the vicinity, and the views out to sea are wide, embracing the full stretch of the Firth, from the Bridge to May Isle, and the Bass Rock, with, on a clear day, the hills of Edinburgh.

Approaching Kirkcaldy, the silver sands of Burntisland and Kinghorn and the pleasant coast views give place to the sober industrialism of Kirkcaldy, described as the "hundred and nineteenth psalm of Scottish burghs." Kirkcaldy is a great centre for the manufacture of oilcloth and linoleum, and has many other factories. The harbour is connected by a steeply-graded branch with the main line. A fair shipping trade is done, but chiefly of a general character. Sinclairtown and Dysart are virtually extensions of the "lang toun." Beyond the latter station the line cuts across inland to Thornton Junction, one of the busiest centres on the North British system apart from the great towns.

The main station at Thornton is of the "island" type. At each end a single terminal bay line is let in, to receive connecting trains. The central part accommodates waiting rooms, offices and refreshment rooms. Alongside is a single platform used for Methil branch trains. These curve away sharply almost within station limits, hence the need for a separate platform. A footbridge connects the main and Methil platforms, and also gives access to thoroughfares on either side of the station. North of this footbridge the line bifurcates, the Leven and Crail line diverging eastwards, while the main line

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continues straight ahead, and to the west is a mineral branch. At the south end of the station the Lochgelly and Kelty branch diverges alongside the remains of the original station buildings, and the engine sheds are located on this section. The whole area is, however, a maze of interconnecting lines, goods roads and carriage and coal storage sidings.

The Methil branch is usually worked by a 0-6-0 tank engine and six or seven six-wheeled coaches. It has a fairly frequent service, and constitutes the main passenger access to Methil. Coal traffic to the docks, however, mainly passes *via* Cameron Bridge junction on the Leven and Crail line.

Leaving Thornton the Methil branch is single, with intermediate stations at West Wemyss, Wemyss Castle, and Buckhaven. From West Wemyss to Buckhaven, however, it is paralleled by colliery lines, passing alongside West Wemyss and Lochhead Collieries. There are connections between the branch and the colliery lines, but most of the traffic is worked by the Wemyss Coal Company's own engines, over their own route to Methil, crossing the branch near Wemyss Castle station and continuing on the landward side to join with other colliery lines running into Methil. Near Wemyss Castle and Buckhaven stations the branch runs close to the sea, overlooking the coast. These places are, in fact, holiday centres on a small scale. At Methil there are various interconnecting lines, and alongside the passenger station are extensive coal sidings, but, as already indicated, the passenger traffic is worked on the branch almost independently of the general coal traffic which reaches the docks either from the Leven direction or *via* the private lines. The passenger station has only a single platform, with usual station offices.

From Thornton Junction to Leven, the Fife Coast line is double track, mainly because of the heavy coal traffic, as far as East Fife Central Junction, beyond Cameron Bridge station, where the branch to Kirkland Yard and Methil Dock diverges. The Methil Docks were fully described in the August, 1919, RAILWAY MAGAZINE; hence a few general remarks will suffice here. The original dock was opened in 1887, equipped with three coal hoists and having a water area of 4¾ acres, but two of the hoists have since been demolished as a result of the reconstruction of the docks. No. 2 dock (6½ acres), built as an outer extension of No. 1, was added in 1897. The two are separated by lock gates, while the entrance to No. 2, between jetties, gives access to both. No. 2 has three hoists, so that these two docks have four hoists.

Photo.] **METHIL STATION.** [*J. F. Gairns.*

Showing Thornton Junction–Methil local train. 0-6-0 tank engine.

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No. 3 dock was constructed under powers obtained in 1907, but was not completely brought into use until 1915. It has a separate entrance channel 120 ft. wide, and has five coal shipping berths and six hoists, two being available for simultaneous coaling at one berth. These two hoists have radial shoots, so that coal can be loaded through four hatches without moving the vessel. Two hoists are capable of lifting 35 tons to a height of 55 ft., the others to 45 ft. Weighing machines and anti-breakage appliances are fitted, and all hoists have high level runaway lines on which emptied wagons run away by gravity when released. As many as 60 wagons have been dealt with at a single hoist in one hour, and the facilities are sufficient to permit of the shipment of over five million tons of coal per annum. Complete dock premises are provided, including warehouses, power station, offices, etc., and in combination with the yards at Kirkland and the storage sidings towards Methil station, there are no fewer than 32 miles of railway track. Four tracks are provided between Kirkland Yard and the dock. To avoid conflict of traffic the lines from the Methil direction to the north side of No. 3 dock are carried on concrete viaduct over those from the Kirkland direction to Nos. 1 and 2 docks. A massive sea wall encloses the whole of the undertaking.

Leven is within easy walking distance of Methil, and consideration of the "Fife Coast Line" may be resumed from that point. Leven itself is a favourite holiday and residential centre, and thence all the way to Crail the line closely follows the coast, generally within sight if not actually alongside its sandy stretches. Through Lundin Links—a non-crossing station, serving a favourite golfing district, the links being between the railway and the sea and ideally situated—and Largo—another interesting place beneath the shadow of Largo Law, and boasting a small fishing harbour (the railway crosses on a high viaduct)—the line skirts Largo Bay, beautifully sanded, and giving splendid bathing facilities. It then strikes inland a little to cross a headland, with an intermediate crossing place at Kilconquhar West, the station of Kilconquhar, a short distance beyond, being non-crossing. This serves another favourite holiday district. At Elie the coast is rejoined. This is quite a busy place in the holiday season, and has many attractions, golf being by no

Photo.] [*Leslie J. Thompson.*

DUNDEE-EDINBURGH "FIFE COAST" EXPRESS VIA CRAIL CROSSING THE FORTH BRIDGE.

4-4-0 superheater engine No. 426, "Norna."

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means the least. Passing St. Monans and Pittenweem, Anstruther station is reached, serving the twin townships of Anstruther-Wester and Anstruther-Easter, two Royal burghs and the centre of a local fishing industry, as well as a favourite holiday resort and tourist centre. The old station is now used as the goods depôt, the line when continued eastward to Crail necessitating a curve and a new station. Crail is another fishing and holiday town, completing a remarkable series of tourist, golfing and holiday resorts of which so many occur in this part of "the East Neuk of Fife." The remainder of this line round to St. Andrews calls for little comment, the intermediate stations, Kingsbarne, Boarhills, Stravithie and Mount Melville serving mainly agricultural districts.

At St. Andrews the station is in a deep cutting, and consists of a sharply curved island platform reached by an overhead footbridge. The town itself is of considerable size, accommodating the University, a large number of high-class schools and colleges. At holiday periods traffic at the station is very heavy, involving luggage on a large scale during the arrival or departure of men and women students and boys and girls belonging to the colleges and schools, and journeying from or to all parts of England and Scotland. This large scholastic addition to the resident population involves a heavy traffic all the year round, while the University and the golf courses attract visitors of all ranks, from the highest to the lowest, at all seasons. In summer the holiday and golfing attractions of the town add still further to the volume of traffic. There is also a steady stream of traffic between St. Andrews and Dundee, both residential and incidental.

Proceeding westward from St. Andrews, the line passes between golf links, with glimpses of the sea not far away, until at Guard Bridge station the river is crossed by a steel viaduct. Cutting across country the main line is joined at Leuchars Junction. This has an island platform, with a single bay line let into it at each end to accommodate branch trains connecting with those on the main line. In several instances local trains from Dundee are thus placed out of the way of a following express with which it makes connection as a branch train to St. Andrews.

The direct route from Leuchars Junction to Dundee proceeds across country to the south end of the Tay Bridge, having triangular connections near St. Fort with the Newburgh and North Fife Railway. The old line proceeds to Tayport, where there is a small harbour whence connection was originally made with Dundee by the ferry across to Broughty Ferry. Tayport is, however, an important residential town, and there is a regular suburban service to and from Dundee, serving also the favourite districts of East and West Newport. The line from Tayport to the Tay Bridge follows the banks of the Firth of Tay closely—trains on the Dundee and Arbroath Joint line can frequently be seen following in parallel course on the other side of the Firth—joining the main line at Wormit Junction. Here the branch only has platforms, sharply curved, main line trains joining just north of them. Wormit is the centre of a considerable residential traffic of Dundee people.

Dealing now with train services, and considering first the North Queensferry-Thornton section, North Queensferry and Inverkeithing have the benefit also of trains on the Dunfermline and Perth lines, together with locals between Edinburgh and Dunfermline, so that, in the aggregate, they have good residential traffic facilities to and from Edinburgh. Onwards to Thornton, however, only main line trains are concerned. Included are Glasgow as well as Edinburgh trains, many being more or less fast. Burntisland and Kirkcaldy have stops by many semi-fast and some of the main line express trains, while Aberdour has several fast services. In any case, it is but rarely that an hour elapses without a stopping train at any of these stations, and frequently the intervals are much less.

Among the standard trains on this section the more remarkable include the 8.47 a.m. from Glasgow, which, after calling at Dalmeny, is fast to Aberdour, then serving Aberdour, Burntisland, Kinghorn and Kirkcaldy before running on to Thornton; the 1.15 p.m. from Edinburgh, which runs from Haymarket to Aberdour, and then serves Burntisland and Kirkcaldy to Thornton; and the 4.25 p.m. from Edinburgh, calling at Inverkeithing, Burntisland and Kirkcaldy to Thornton. Through trains from Glasgow leave Queen

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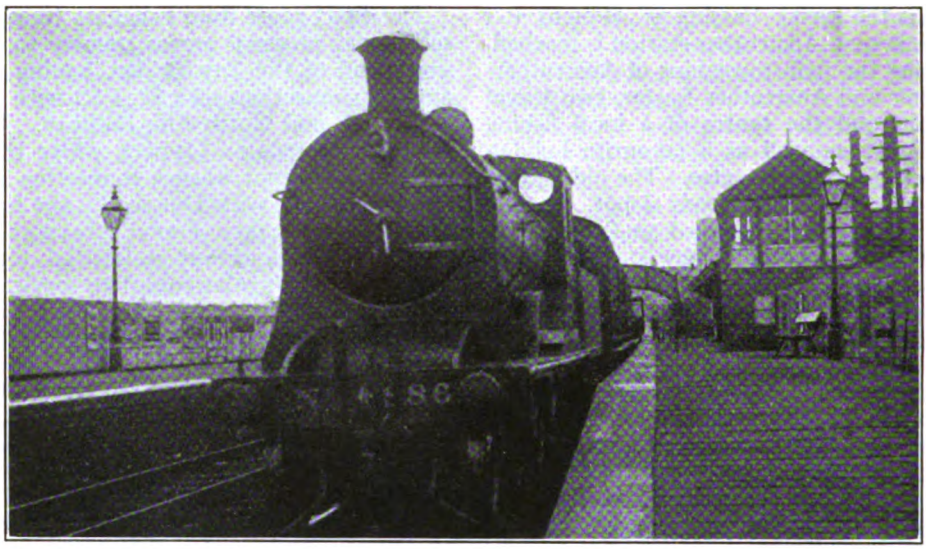

Photo.] DUNDEE-EDINBURGH TRAIN *VIA* CRAIL AT ANSTRUTHER. [*J. F. Gairns.*

Street at 8.47 a.m., 12.34, 2.15, 4.22 and 7.0 p.m. In the opposite direction the 8.28 a.m. from Thornton serves Kirkcaldy, Burntisland and Aberdour; and there are several semi-fast main line trains (this applies both ways) calling at Burntisland, Kirkcaldy and sometimes serving Aberdour also.

In summer the service is considerably amplified. On Saturdays a special express from Waverley at 1.8 p.m. for the Fife Coast calls at Aberdour, Burntisland and Kirkcaldy, thence running fast to Leven. There is also a special Glasgow express from Queen Street at 4.10 p.m. for the Fife Coast, which calls *only* at Aberdour between Glasgow and Leven. It is followed by a local train enabling passengers to change for Burntisland, Kinghorn, etc. In the up direction Aberdour is served at 8.34 a.m. by a Glasgow express corresponding to the 4.10 p.m. from Queen Street. On Saturdays during the holiday season and at "month-ends" many of these trains are frequently divided or reliefs run.

On the Fife Coast line only about three trains each way make the complete journey to or from Dundee *via* St. Andrews, others terminating at or starting from Leven, Elie, Anstruther or Crail. The winter service provides for seven or eight trains daily at most stations. Some of these are locals from Thornton Junction, usually starting from the northern bay line, but several are through, notably the 9.0 a.m. and 5.12 p.m. from Waverley through to Dundee, and the 7.56 a.m. and 2.15 p.m. from Dundee. An important train running all the year round is the 10.35 a.m. from Anstruther to Glasgow.

In summer the services are considerably amplified. Thus, the 12.21 p.m. from Thornton is semi-fast; the 1.8 p.m. Saturday express from Edinburgh reaches Leven at 2.21 p.m. and is semi-fast to Crail; the 4.10 p.m. "Fifeshire Coast Express" from Glasgow calls only at Aberdour to Leven and is then semi-fast to Crail and non-stop thence to St. Andrews; the 4.52 p.m. from Edinburgh is non-stop from Haymarket to Thornton and omits two of the branch stations to Crail, where it terminates. In the opposite direction the 6.50 a.m. from St. Andrews, through express from Dundee to Glasgow, is non-stop to Crail, omits St. Monans and Kilconquhar and runs non-stop from Leven, except for a call at Aberdour; this train is followed 10 minutes later by a corresponding Edinburgh express at 7.25 a.m. from Crail, non-stop from Leven to Haymarket, due at Waverley 9.11 a.m. The 8.42 a.m. from St. Andrews is also an Edinburgh train, while the 10.30 a.m. from Anstruther becomes a combined semi-fast train for Edinburgh and Glasgow. On Saturdays there is a through semi-fast

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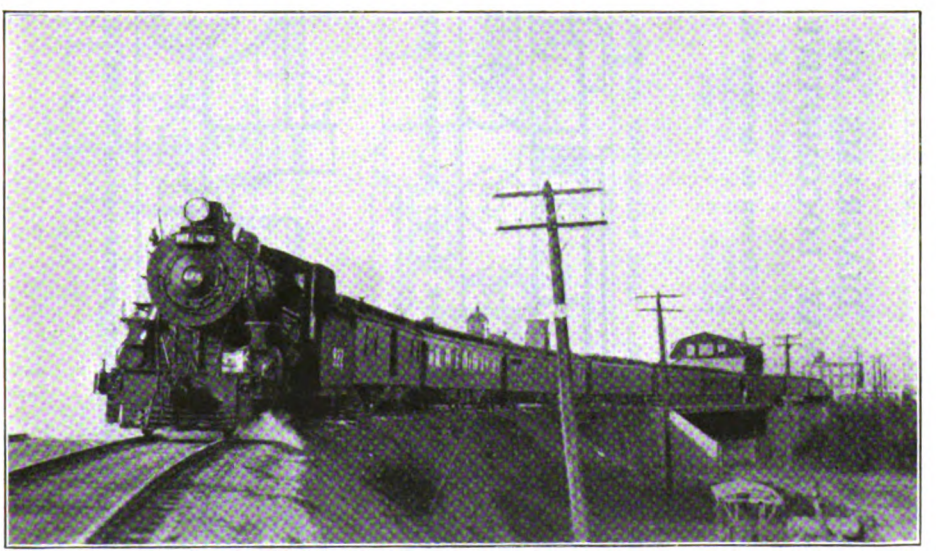
train for Edinburgh from Crail at 6.58 p.m. All through trains are composed of corridor bogie stock, in some cases with semi-saloon compartments, indicating that the traffic is not only a valuable one, but one which justifies suitable accommodation for regular passengers, including large numbers of season-ticket holders.

Between Dundee and Tayport a frequent service of trains is provided to suit residential traffic. A few run through to Leuchars Junction and St. Andrews, and in one or two instances through trains from Dundee to Edinburgh or Glasgow also work round the Tayport loop. As a rule, however, the St. Andrew's services are given *via* the main line and Leuchars Junction, by which route St. Andrews has a good service from Dundee, also obtaining several connections wieh semi-fast main line trains.

The Methil branch traffic is purely of a local character.

The writer is indebted to Mr. J. Calder, General Manager, Scottish Area, London and North Eastern Railway, Mr. J. Walker, Assistant General Manager, Mr. D. McRobbie, District Operating Superintendent, Burntisland, and Mr. J. Wilkie, District Commercial Superintendent, Dundee, together with other officials, for material assistance in compiling this article, also for the supply of certain of the illustrations reproduced.

A CANADIAN NATIONAL RAILWAYS SPECIAL TRAIN.



MR. C. R. LITTLEBURY, of Calgary, Canada, sends several photographs, one of which is reproduced above, showing a special train used to convey Sir Henry Thornton, K.B.E., late General Manager, Great Eastern Railway and now President of the Canadian National Railways, on his first tour of inspection of the system. Sir Henry passed through Calgary on Monday, January 15, 1923, and the photograph was taken as the train was leaving Calgary *en route* to Edmonton, Alberta. The locomotive used was Grand Trunk Pacific Railway locomotive No. 822. The train comprised eight private cars and one baggage car, these being of Canadian National Railways and Grand Trunk equipment.

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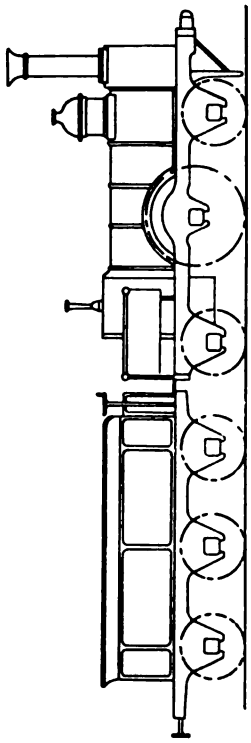
Locomotive Development on the Great Northern Railway (1848-1922).

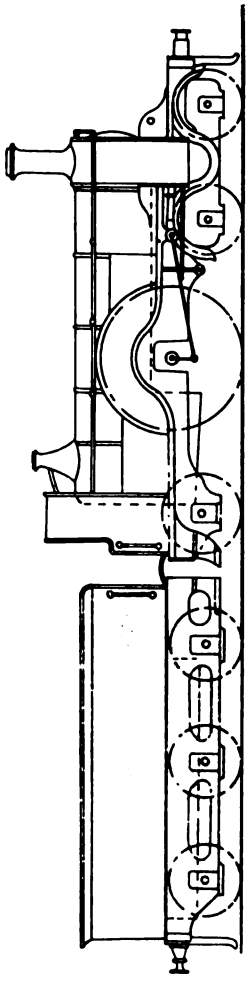
BY the courtesy of Mr. H. N. Gresley we are enabled to reproduce herewith four outline drawings showing collectively and in graphic form the progress made in locomotive development on the Great Northern Railway between the years 1848 and 1922, a period of 74 years. The tabular data given below the diagrams demonstrates briefly but very strikingly the immense difference between the first of the engines—the six-wheeled "single-driver" of 1848, and the latest and largest production of Doncaster works, *i.e.*, the "Pacific" class locomotive, the first of which was placed in service in the spring of last year. The intermediate designs, *i.e.*, Mr. Patrick Stirling's 4-2-2 type, with 8 ft. diam. driving wheels, and Mr. H. A. Ivatt's "Atlantic," form useful comparisons between the two extremes representing the earliest and latest examples used for the purpose of illustration.

COMPARATIVE DIAGRAMS OF GREAT NORTHERN RAILWAY LOCOMOTIVES, 1848-1922.

Drawn to the same Scale.



I.—2-2-2 TYPE LOCOMOTIVE, BUILT BY SHARP, STEWART & CO., GLASGOW, 1848.



II.—MR. P. STIRLING'S 8-FT. SINGLE-DRIVER ENGINE BUILT AT DONCASTER WORKS, 1870.

The engine of 1848 was built by the firm of Sharp, Stewart & Co., of Glasgow, the design being that of the builders. Fifty of the class were delivered to the railway company and were used for work-

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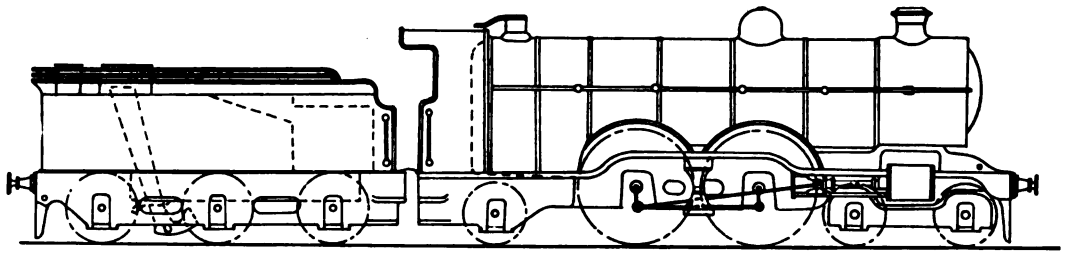
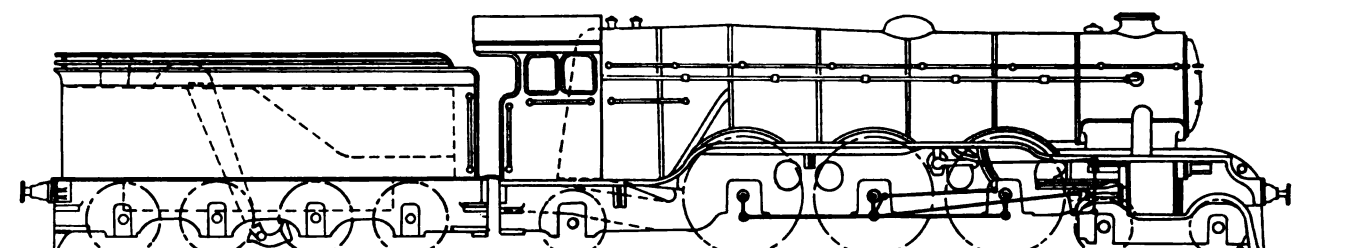


III.—MR. IVATT'S "ATLANTIC" TYPE ENGINE, 251 CLASS, BUILT AT DONCASTER WORKS, 1902.



IV.—MR. GRESLEY'S "PACIFIC" TYPE 3-CYLINDER LOCOMOTIVE, BUILT AT DONCASTER WORKS, 1922.

Type.	Year Built.	Cylinders.	Driving Wheels, diam.	Total Heating Surface.	Boiler H.P.	Cylinder H.P.	Weight of Engine, less Tender.	Tractive Effort.
2–2–2	1848	15 in. × 20 in.	5 ft. 6 in.	748·2 sq. ft.	344	300	18 tons 8½ cwt.	4,636 lb.
4–2–2	1870	18 in. × 28 in.	8 ft. 1 in.	1,165 sq. ft.	635	755	38 tons 9 cwt.	11,245 lb.
4–4–2*	1902	18¾ in. × 24 in.	6 ft. 8 in.	2,500 sq. ft.	1,174	1,052	68 tons 6 cwt.	15,690 lb.
4–6–2†	1922	20 in. × 26 in. (3)	6 ft. 8 in.	3,455 sq. ft.	1,815	1,946	92 tons 9 cwt.	29,835 lb.

* Non-superheated. † Superheated.

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ing passenger traffic. The design included inside cylinders with framing outside the wheels, a raised firebox and other characteristics usually adopted at that period of locomotive history. The boiler horse-power was 344, and the cylinder horse-power 300, and, without its tender, the engine weighed 18 tons 8½ cwt., or only 20 per cent. of the weight of the latest "Pacific" class locomotive. It developed 4,636 lb. of tractive force as compared with 29,835 of the latest pattern, the relationship in this respect being even more marked. On the basis of weight per horse-power the early type weighed roughly 120 lb. per boiler horse-power and 138 lb. per cylinder horse-power, whereas the latest one develops a boiler horse-power of 114 lb., and a cylinder horse-power of 106 lb. of its own weight, that of the tender being disregarded in both cases.

The stirling "Singles," the first of which was built in 1870, achieved a world-wide reputation for excellence of performance. In spite of their low adhesion weight they proved themselves able to deal with heavy train loads, the loss of power and way due to slipping of the driving wheels being on the whole much less than was to be anticipated on theoretical grounds. During the latest years of their existence as main line express locomotives, doing much of the principal work, they were called upon to perform duties of a really onerous kind, combining heavy haulage with speed achievement, and they gave remarkably good results, particularly in the direction of fuel economy. The engine, in this case, weighed 38 tons 9 cwt. and developed a tractive force of 11,245 lb. The boiler horse-power was 635 and cylinder horse-power 755.

In the year 1902 interest was aroused by the appearance of Mr. H. A. Ivatt's first "Atlantic" type engine of the No. 251 class, the outstanding feature of the design being the very large boiler equipped with a wide firebox and large grate area. The striking success of this class has been due in large measure to the fact that the engines are always assured of plenty of steam, even in the most exacting circumstances. The cylinders are relatively moderate in proportion to the boiler, the latter having a total heating surface of 2,500 sq. ft. and 30·9 sq. ft. grate area; the principle on which they were designed being that better results are to be obtained by having an excess of boiler capacity over cylinder volume than to employ very large cylinders, which the boiler will find it difficult or impossible to supply when demands are above the normal.

The engine weighs 68 tons 6 cwt. and develops a tractive effort of 15,690 lb. It has a relatively low adhesion weight, viz., 18 tons per coupled axle, or a total of 36 tons. Its boiler horse-power, as seen, is 1,174 and cylinder horse-power 1,052. The class is numerically a large one, and the majority of the engines are now equipped with superheating apparatus, the total heating surface being 2,597 sq. ft., with grate area 31 sq. ft. They are at present relied upon for doing the bulk of the main line express passenger work between London and York.

The new "Pacific" locomotives have already been described and illustrated somewhat fully in these columns. They rank among the largest and most powerful of their kind, not only in this country, but on the Continent as well. The large and efficient boiler, three single-expansion cylinders, and high ratio of adhesion to total weight provide all the essentials for the satisfactory performance of the heaviest express train haulage. In this design the weight of engine alone is 92 tons 9 cwt., boiler horse-power 1,815 and cylinder horse-power 1,946. The tractive effort is 29,835 lb.

As an example of locomotive evolution on an individual railway system these comparative particulars provide material for a study of unusual interest.

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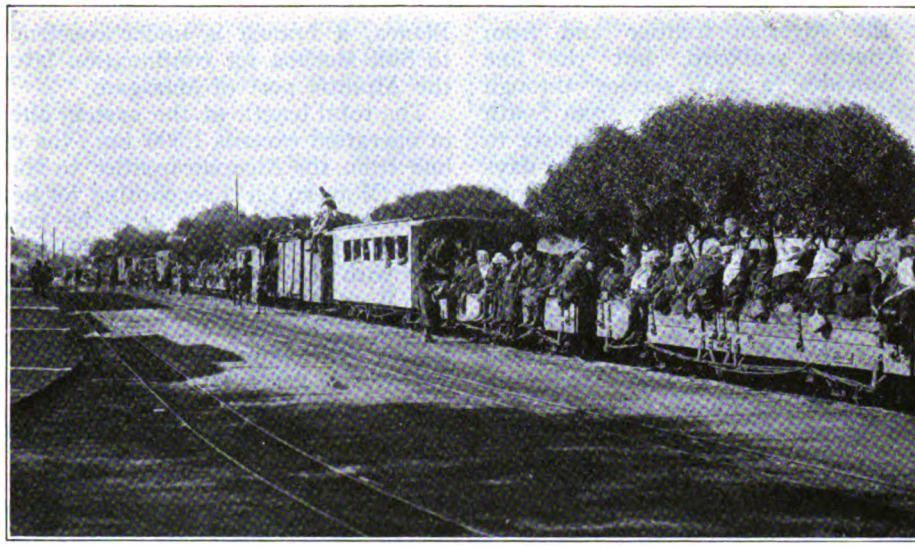

A TROOP TRAIN—OF VERY MISCELLANEOUS STOCK!

By Military Railway Through Morocco.

By GEORGE N. ROBERTS.

THROUGH the good offices of Captain Barbel, and by favour of Lieut.-Colonel Thionnet of the French Colonial Army, the writer, a G.N. (L. & N.E.) Railway District Agent and ex-transport officer, was recently offered the privilege of visiting the French military railways of the Protectorate of Morocco. The opportunity was embraced, and the journey proved one of deep interest. For the facts and figures embodied in this article I wish to record my indebtedness to Lieut.-Colonel Thionnet.

The system of the Chemins de fer de l'ouest-Algérien, now brought to a high state of efficiency, takes one 15 kilometres beyond the frontier station of Zoudj-el-Beghal to the important Moroccan city of Oudjda on the fringe of the Sahara Desert. Passing Sidi-bel-Abbès, one of the principal military stations of North Africa, where the famous French Colonial regiment, the Zouaves, the Foreign Legion and the Chasseurs d'Afrique, receive their hard training, the expresses from Tunis, Algiers and Oran run through Tlemcen, one of the most delightful of Arab cities, a place of ancient civilization famed throughout the Mahommedan world. No traveller should fail to break his journey there.

Up to this point in Algeria there is a certain degree of comfort in the hotels, although by no means of the standard general in the vicinity of the capital, in Oran or in Tunis. Arrived at Oudjda, however, a decided change is noticeable, and one recognises that Morocco has been reached. The place is wilder, dirty and somewhat forbidding; in fact, the contrast with charming Tlemcen is startling, and it is no matter for surprise that the Europeans here are generally armed. The French quarter is very small, and the one hotel is always crowded. It is the halting place of all the officers, adventurers and business men who enter the country from the East, and the rendezvous of the officials and other exiles domiciled in Oudjda.

The construction of the Moroccan railways, described in this article, was commenced in 1911, solely to assist the advance of the French Expeditionary Force, work proceeding simultaneously

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from the Algerian frontier and from the Atlantic seaboard, but the line now provides a rail service through French territory all the way from South Morocco through Algeria and Tunisia to the frontier of Tripoli. In the early days of the occupation of Morocco the French Army encountered considerable opposition between Casa Blanca Rabat and Kénitra, and the part of the line connecting those bases was therefore pushed ahead very rapidly by the military engineers to follow up the advancing troops. This region is now apparently quite pacified, but conditions in the East of the Protectorate are more unsettled; Blanca, a branch is under construction to Sidi Machoa for continuation later to the Altantic port of Mazagan.

The total length of the system already in operation exceeds 1,300 km., the main line from the Algerian frontier to Marrakech (Morocco City) accounting for nearly 1,000 km. The latter is to be pushed south and eventually will doubtless connect with the French railways of Senegal and West Africa generally. Little imagination is required to realise the great benefit which must follow. Parts of the line were of necessity built very hurriedly to ensure supplies for the troops and there exist several types of track.

MOULOUYA RIVER BRIDGE, DAR-EL-CAID.

in fact, the branch line from Guercif to Outat-el-Hadj was constructed primarily, if not exclusively, for military reasons, and it is now being extended south to Kasbah el Maghzen to consolidate the military position. On the other hand, the branch line from Ber Rechid to Oued Zêm, although built under military auspices, was constructed mainly to exploit the phosphates of the locality. This also is now being extended.

The two branches named are the only ones at present open, although others are being built, from Meknes to Khenifra, and from Kénitra to Ouezzane on the borders of the Spanish zone in the north. At Sidi-Ali, on the main line south of Casa

1. Sections on the Péchot system, imported in lengths of 1.25 m., 2.50 m. and 5 m., with rails of 9½ kg. per metre, riveted to metallic sleepers, ready for laying.

2. Italian rails of 10 kg. per metre, fixed by clips to metallic sleepers as the road progressed.

3. Vignoles rails of 10 kg. per metre, on wooden sleepers.

4. Vignoles rails of 15 kg. per metre, of American origin, on wooden sleepers.

The last named are in use on the sections of the line conveying the heaviest traffic. The water courses encountered during the advance were bridged originally by wooden structures, attaining in some cases a length of about 200 yards, but

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survey and upkeep proved so costly that they have now nearly all been replaced by bridges of steel girders, on concrete foundations.

The railway from the Atlantic base at Casa Blanca had reached Meknes about two months before the outbreak of the European War in 1914, although the southern portion of the main line to Marrakech was not open until July, 1920. Meantime the military engineers were pushing ahead from the east, and looking forward to the day when they would meet their comrades from the west. In April, 1913, railhead was at Taourirt, and in August of the same year at Guercif, but the war came before it reached Taza, and naturally little progress was made during the great struggle. In fact, it was twelve months after the outbreak before Taza became the railhead, and even so recently as a little more than a year ago there was no railway service west of Chbabat, 64 km. from Taza, and no regular means of getting from Chbabat to the capital, Fez.

At Oudjda I joined a party of French officers, some of whom I had met in Marseilles. We left Oudjda on the 10 hours' trip of 230 km. for Taza. All travelled light, no officer being allowed any heavy baggage. There is, of course, little comfort on such a journey, military needs being the chief consideration, although the intention is to convert the line for ordinary purposes at the earliest possible moment. At present only a limited number of civilians can be accommodated in each train, so there is competition for seats.

The ordinary trains are hauled by steam locomotives and are utilized chiefly for the transport of troops, guns, stores and civilian merchandise. There are also "express" trains hauled by "Draisine" (motor cars on rails), with only about a couple of open light coaches attached. These travel at considerable speed, but all trains, including the "expresses," stop at every station, which fact explains the length of time taken on the journey. The service by "Draisine" is used chiefly by officers travelling apart from troops and by business men.,

Although for considerable distances the track from Oudjda to Taourirt is as straight as the famous road from St. Petersburg to Moscow, the exact reverse obtains in the mountainous regions near Taza and at other points. There are no tunnels, the aim of the army engineers being to get this 60 cm. line built and in operation as rapidly as possible. Straightening, and therefore shortening, also widening to the ordinary gauge of 1 m. 45 cm., are to follow almost immediately to obviate change of carriage at the Algerian frontier and to meet the needs of increasing traffic. As a general rule the gradient does not exceed 20 mm. per metre (1 in 50), the minimum radius of curves being usually 100 m., but there are sections of the line where, through military necessities having compelled exceptionally rapid construction, with the minimum of labour, there are curves having a radius of 50 m. and gradients of 3 in 100.

There are between Oudjda and Taourirt six stations, viz., Oued Juif, Naima, Oued Bou Redim, El Aïoun, Semouna-Bérard and Mestigmeur, and the long stops there enabled one to observe the primitive types of the inhabitants. There were many unveiled, tatooed, scantily-clothed and particularly graceful women of a type foreign to the country. They were women of the Congo married to soldiers of the negro Senegalese infantry quartered in the vicinity.

East of Taza I saw the mirage, with its unfulfilled promise of glorious rivers, in a land where at the time every watercourse was dried up. Mosquitoes made their presence felt unpleasantly, and I also encountered specimens of the locust, though, fortunately, not in large numbers, as on one occasion, years ago, when, in the adjoining colony of Algeria, they darkened the sky and almost brought our train to a standstill. The insects covered the land to a depth of several inches and only very slowly could we grind our way through the mass on the railway track.

The section of the line from the Sahara to Taza is that on which any adventure which may arise is likely to present itself. The Colonial Army authorities are, however, too much alert to take any unnecessary risks. Although not apparent to the casual observer, the railway stations in districts where there is reason to fear surprise attacks by tribesmen, have been specially constructed to be readily adapt-

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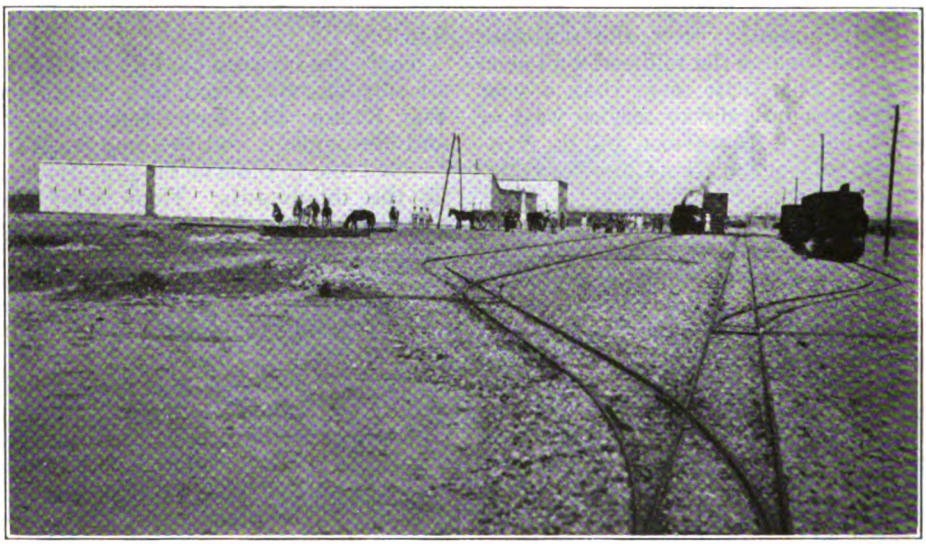
able for military defence. No trains are run by night on any section.

Midway in the dangerous area, between Oudjda and Taza, a powerful and closely guarded wireless station has been erected, and I observed military posts, both cavalry and infantry, the latter chiefly men of the Foreign Legion, of Senegalese negro battalions and of Tunisian Arab regiments, close to the line, every few kilometres, practically all the way between the two cities. There is frequent sniping at the trains, and when I arrived in camp at Taza the body of a French officer was brought in. He had been picked off by a fanatic able to take deliberate aim from the shelter of some boulders. Such mis-

in Fez, the news arrived that the two sections had met and laid the connecting rails at Dar Caid Omar, and the road through from Algeria to the Atlantic is now in actual use. Fez was reached from the military bases in the west in February, 1915, although, very few years earlier, it was a perilous undertaking for a white man to attempt to enter the place. I saw carpets and furniture in course of manufacture in what before the French occupation was the Sultan's arsenal and palace, a place where men were thrown to the lions when I was first in Morocco. Fez is the most mystic city it has ever been my lot to see, but I cannot attempt to describe it in this article.



YARD AT A DESERT STATION.

adventures are, however, accepted as part of the ordinary risks of the Colonial soldier. The hostility to-day in the French zone of the country is almost confined to the military line and its patrols, and there will doubtless ere long be complete pacification of the whole route. The more enlightened of the natives are already making use of the railway.

From Taza we had to go forward 125 km. by automobile to Fez, the line not being completed. Large numbers of men were, however, busily engaged on the work, and it was apparent that very little remained to be done; in fact, whilst I was

The through rail connection just established would probably have been made seven years ago, but for the European War. Taza was taken by the French in 1914, just before the commencement of the great conflict, and it is said that up to that time no white man had ever been able to visit the city, so fierce and fanatical were its inhabitants. Yet, twelve months later, in July, 1915, Taza was the railhead from the East.

From Fez to Casa Blanca, 341 km., is a 14 hours' journey, and one of quite a different type to that east of the capital, the country being much more civilized. No one making it should miss the interest-

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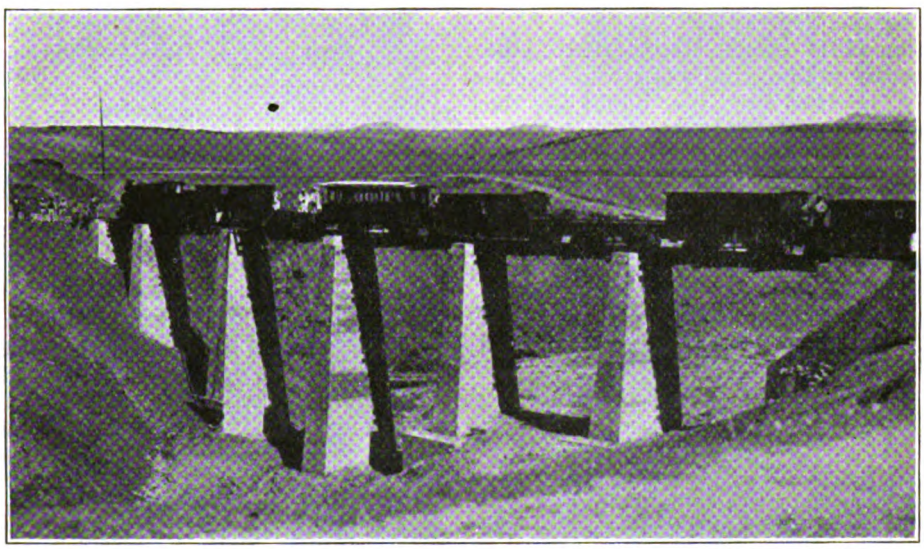
ing and pleasing intermediate cities of Meknes and Rabat. The most surprising town is Casa Blanca, which, to-day, with its trams, hotels, cafés, shops and general bustle, reminds one of Marseilles, although a dozen years ago it was merely a big African village fanatically opposed to European penetration, and particularly to railways, the dock lines at first laid being torn up by the natives. There are several British commercial firms established in and near the town, and the land is being exploited by a very cosmopolitan crowd, although the French naturally predominate. The Bank of British West Africa has opened various branches in the country, including one in Fez itself, but perhaps the most enterprising company in Morocco to-day is the Compagnie Générale Translantique which has a branch in London, No. 22, Pall Mall, It has established hotels throughout the country, instituted touring motor services, and arranged for the trip by its mail steamers between Bordeaux and Casa Blanca to be made in about three and a half days. Generally speaking, the British are not as much in evidence as one could wish, and in the interior I met two Englishmen only, both resident in Morocco. In Casa Blanca, however, a small English colony exists.

The first locomotives utilised on the military railways were of the Mallet type, some of 8 tons and others of 16 tons, constructed at the Decauville Works, and at the Weidnecht establishment, but as, during the European War, the requirements of the French Army at home absorbed practically all the production of the French builders, the needs of the Moroccan railway had to be provided for by American engineers, and "Baldwins" of 10 and 12 tons were purchased. After the Armistice some "Schneider" and "St. Chamond" engines were liberated by the home army and transported to Morocco, and a few months ago several



A BRIDGE IN THE DESERT.

15-ton 10-coupled locomotives were shipped by la Société Alsacienne de Constructions Mécaniques à Mulhouse. The French firm of Decauville supplied most of the passenger coaches and goods wagons, but there are some American trucks, both open and covered, of the Middletown type.

The service by steam locomotive is very slow, the maximum speed being 20 km. an hour, the speed of the troop trains. To meet the necessities of the post, however, of officers changing stations, and of business men, the "Draisine" engines already referred to were instituted, and this service by "automotrice" instead of by locomotive is rapid. Here England

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came in, " Drewry " cars being purchased. Others were supplied by the French firm of Campagne. The institution of the " Draisine " service enables the run from the Algerian frontier to Casa Blanca to be accomplished in two days, including a night's rest at Fez.

There are sleeping cars and restaurant cars in Tunisia and Algeria, and they will run through from the eastern Mediterranean to the Atlantic as soon as the military line has been widened to the standard gauge, but in the meantime buffets have been opened at some of the principal stations, at one or two of which table d'hôte meals are supplied whilst the train waits, as was customary in France on long distance runs before restaurant cars became general.

From 1911 until March, 1916, the Moroccan military railways were exclusively reserved for the needs of the Expeditionary Force, but on the latter date it was decided to cater also for civilian requirements as far as was practicable, to assist in the development and pacification of the country. The organisation of commercial matters has been based on the methods of the Administration of the railways in France.

Passenger tickets are issued to civilians at the following rates :—

	Per kilometre. Francs.
First-class	0·33
Second-class	0·165
Third-class	0·088

Each passenger is allowed 30 kilos. (66 lb.) of baggage free.

Goods traffic has been classified into six series according to the nature of the commodities, and the charges are per ton per kilometre. The ordinary tariff is as shown in the following table.

Class or series.	Distances of 1 kilometre to 100		Distances of 101 kilometres and over.	
	Fr.	c.	Fr.	c.
First	1	30	1	10
Second	1	20	1	00
Third	1	10	0	90
Fourth	1	00	0	80
Fifth	0	90	0	70
Sixth	0	80	0	60

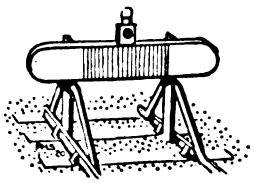
Exceptional rates, lower than the above, are quoted in special circumstances under certain conditions.

The figures given below show the increasing extent to which the military track now completed is being utilised by the civilian population, native and European :—

Year.	Passengers Kilométriques.	Goods traffic. Tonnage kilometrique.
1917	49,163,919	29,332,216
1918	69,085,242	33,328,263
1919	81,601,778	33,732,973
1920	91,886,675	37,409,366
First half-year, 1921 ..	43,706,084	23,702,985

It is expected that by the time the alteration of the new road to the normal gauge of 1 metre 45 centimetres is completed the country will have become sufficiently peaceful to enable the military to hand the line over to civilian management, and, judging by the immense change already effected in the west of Morocco, I think it probable it will be found practicable.

France has performed an important service in constructing, so soon after the occupation, this vital link in the international system of communication. It provides a quick route from West Africa to Malta via Tunis, and no doubt there will eventually be a line through Tripoli connecting with the railways of Egypt and the Soudan.



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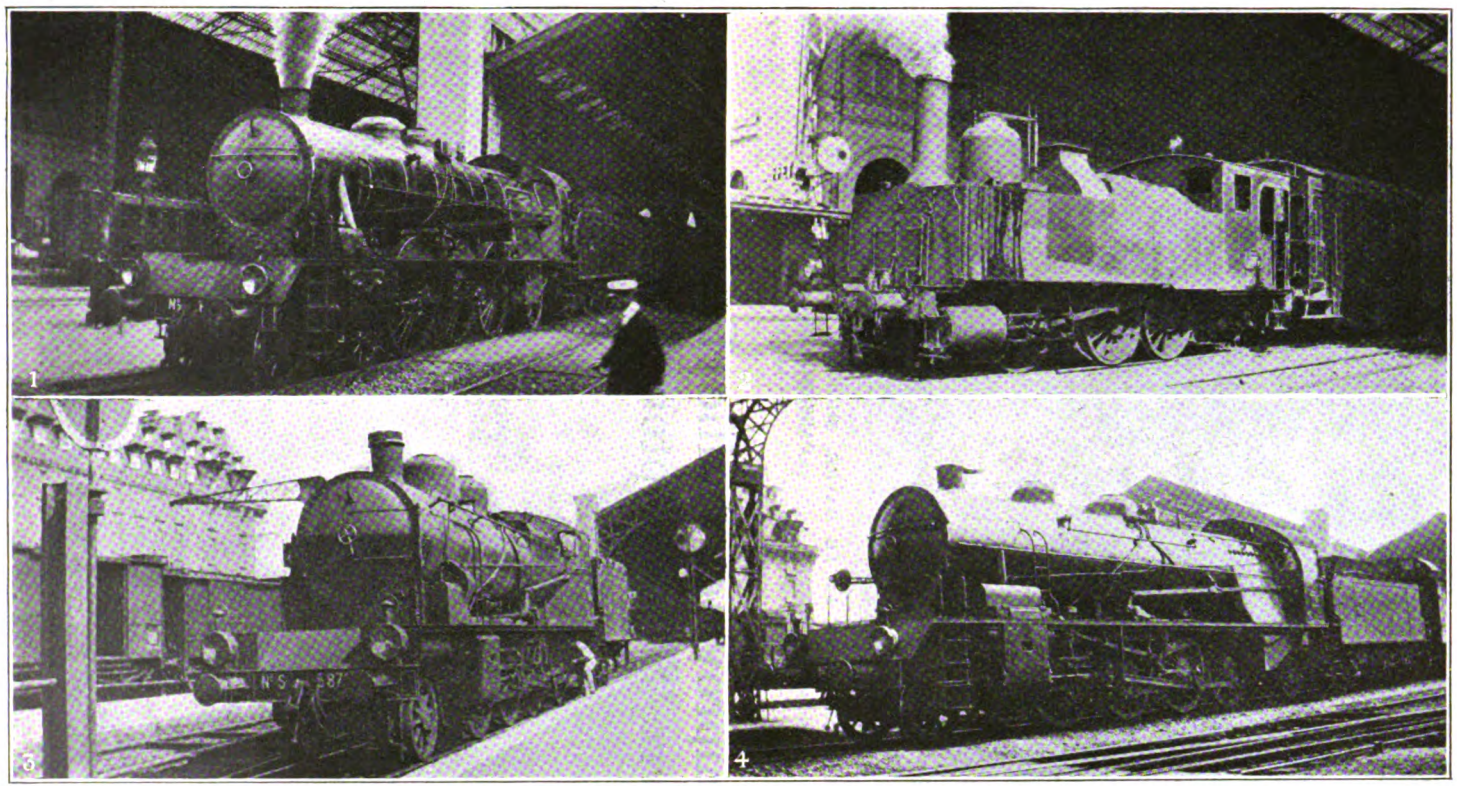
FRENCH LOCOMOTIVES AT WORK.

Photographed at Lyons by F. Scott and V. New.



1.—4-6-2 LOCOMOTIVE NO. 6278, ATTACHED TO "RAPIDE" TRAIN FROM MARSEILLES. 2.—OLD 0-6-0 TANK ENGINE NO. 7517 USED FOR PASSENGER TRAIN SHUNTING. 3.—2-8-0 LOCOMOTIVE NO. S 3876. 4.—2-8-2 LOCOMOTIVE NO. 1191.

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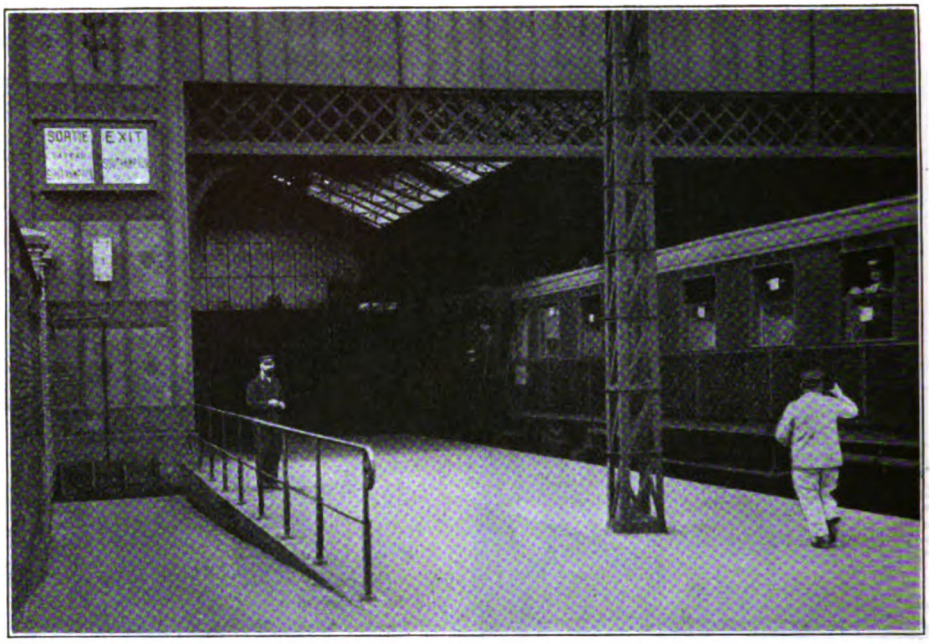

TRAIN FROM PARIS AT LE HAVRE, SHOWING NEW EXIT FOR ENGLISH STEAMER PASSENGERS.

Improving Traffic Facilities on the Havre–Southampton Continental Route.

ALTHOUGH not the shortest between Paris and London, the route via Le Havre and Southampton is in considerable favour with business men in that it is possible to obtain on the steamers an uninterrupted night's rest while crossing the Channel. It is also in great favour with tourists, partly for the same reason, but more particularly in view of the scenic interest of the journey between Le Havre and Paris via Rouen, and various facilities which can be associated with that route. These include travelling during the summer by the boats of the Compagnie Rouennaise de Navigation, between Rouen and Le Havre, as an alternative to the rail journey, on payment of a small supplement, and break-of-journey arrangements allowing through passengers to visit places of interest within easy reach of Le Havre, but off the direct route. On both sides of the channel the trains are provided with restaurant car accommodation, seats can be booked beforehand and comfortable berths on the steamers reserved free of charge.

For some time it has been felt, however, that the distance to be traversed between the French State Railway station at Le Havre, and the berth at the Quai de Southampton used by the London and South Western (now Southern) Railway steamers constituted a drawback. For a variety of reasons it has not been found possible for the steamers to berth alongside a quay at Havre offering *direct* rail communication with the main station. Only a proportion of the passengers travelling by steamer proceed from or to Paris—a not inconsiderable number remaining in Havre, travelling on to Etretat or crossing over to Honfleur, Trouville, or Caen by the little steamers which berth alongside the cross-Channel boats. The convenience of these people has to be taken into account, and although many alternative schemes have exhaustively been

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TRANSFERRING PASSENGERS' LUGGAGE FROM STATION THROUGH NEW PASSAGE TO PLATFORM AT LE HAVRE.

SPECIAL ELECTRIC TRAMCARS WAITING OUTSIDE LE HAVRE STATION FOR PASSENGERS FOR SOUTHAMPTON STEAMER.

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examined, so far no berth has been found better than the one at present occupied.

To speed up the homeward journey measures have recently been taken which proved very successful. On the 7.40 p.m. train from Paris (St. Lazarre), connecting at Havre with the Southampton steamer, the rear vehicles are reserved for passengers travelling to or from England. On arriving at Le Havre terminus due (10.50 p.m.) the train comes to a stop with these vehicles adjacent to a new exit provided specially to meet the convenience of through passengers, who are thus enabled to proceed directly to special electric tramcars which are in waiting just outside.

Immediately they are loaded the cars pass down the Boulevard de Strasbourg, turn into the Place de l'Hotel de Ville, proceeding thence by the Rue de Paris through the Place Gambetta, and finally draw up at the Quai de Southampton. Passengers enter the Customs shed for the examination of their hand luggage, after which they must present their passports at a window in a corner of the room. After examining the passport, the official hands it back with a card authorising the passenger to embark, but if he has registered luggage he must be careful before going on board to claim his trunks and have them marked by the Customs Official. This formality is a very important one, because the registered luggage cannot be put on board until it bears the Customs chalk mark, and great delay and annoyance are caused to passengers who find, on landing at Southampton, that their trunks have not been shipped for that reason.

Through-registered baggage from Paris to England is conveyed by motor vans from Havre station to the quay, and arrives there almost as soon as the tramcars with passengers. The steamer sails from Havre at midnight, due Southampton at 6.15 a.m. next day and Waterloo 9.15 a.m.

In conclusion it may be added that the London and South Western (now Southern) Railway has an office in a central location in Paris, at 253, rue St. Honoré, and one in Le Havre, on the Quai de Southampton, opposite the steamer berth.

MIDLAND GOODS ENGINE ON THE LONDON & NORTH WESTERN SECTION OF THE LONDON MIDLAND & SCOTTISH RAILWAY.

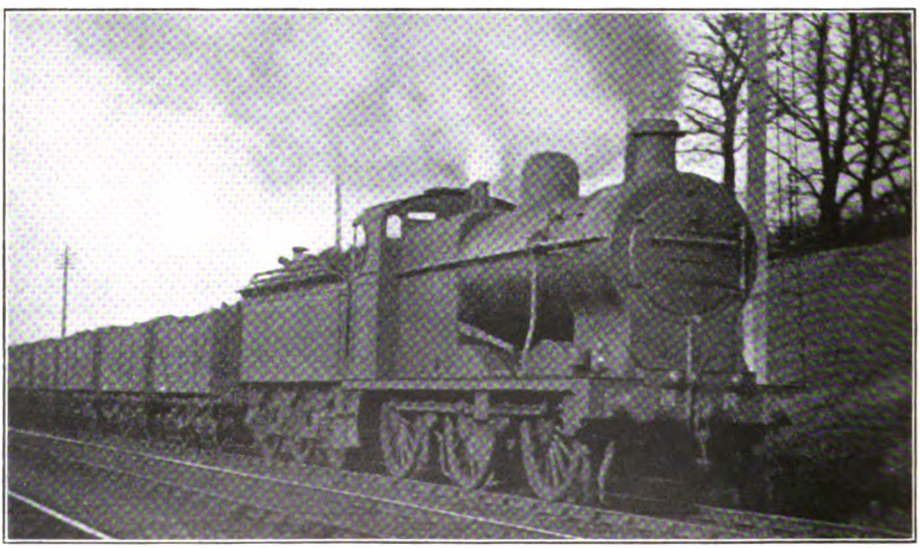

Photo.] MIDLAND 0-6-0 LOCOMOTIVE ON GOODS TRAIN ON LONDON & NORTH WESTERN LINE NEAR BLETCHLEY. [*Chas. S. Lake.*

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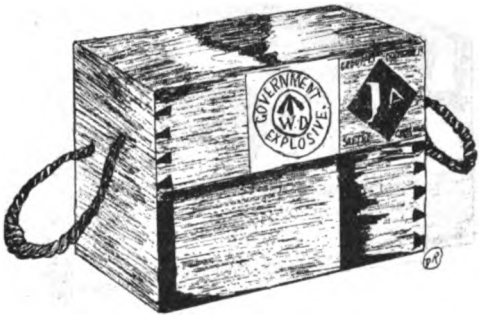
Dangerous - - Goods. - - -

By S. T. JAMES.



PACKING AND LABELLING OF CARTRIDGE CONSIGNMENTS.

THERE are over 1,000 articles which it is considered dangerous to transport by rail. They include explosives, combustibles, inflammable liquids and chemicals that are either poisonous or corrosive. Before anything under the first heading is accepted for conveyance by rail, 48 hours' notice must be given, so that suitable preparations can be made.

For the application of general safety principles, the explosives are divided into seven classes. Gunpowder forms a section to itself. "Nitrate mixtures," under 23 heads, "Nitro-compounds," which embraces over 200 articles such as geglinite, dynamite, cordite and guncotton; "Chlorate mixtures," of which there are three; "Fulminates," comprising three articles only; "ammunition," which includes fuses, percussion caps; fog signals and "Fireworks," making up the seven.

No item included in any of these classes may be loaded except during daylight, and even then only during hours specially set apart for the job. The same precaution is taken with over 50 "dangerous" (inflammable) liquids, and with several hundred corrosive and poisonous chemicals. Thus there is no excuse for a light in the vicinity of the work, nor for leaving the commodities lying about exposed.

Only a selected few of the various articles mentioned are accepted for conveyance on Saturday, Christmas Day, Good Friday, or at the time of any general holiday. The days preceding Christmas and Good Friday are also forbidden except for a few "additional" explosives such as percussion-caps, safety fuses for railway blasting, and fog-signals. The object of this rule is, of course, to prevent anything dangerous being kept in railway trucks or on railway premises during the week-end or holiday, for during such times the companies feel themselves unable to maintain sufficiently stringent precautions, and naturally will not accept a risk they can avoid.

But it is in the packing and protecting of the commodities that the greatest trouble is necessary. The barrel, case or cylinder must always be so strong and solid that it cannot possibly be opened or become defective, either through accident or design, during the railway journey. This, to say the least, is a tall order. Within the receptacle there must be an "inner packing," so thorough as to prevent the slightest possibility of percolation, as this would bring the explosive into contact with the outer case. Both inner and outer packing have to be guaranteed entirely free from dust or grit, as this would cause friction that might set up heat, with disastrous results.

Neither the inner nor the outer packing may contain either iron or steel, unless this is entirely buried in the woodwork, and having once been used for a particular item the case must not be utilised for any other. An exactly similar consignment, may of course, be packed into it, but no other explosive, nor, indeed, any other commodity whatever must be sent.

Very stringent, too, are the limitations of weight. The exact quantity to be placed in either "inner" or "outer" packing is definitely fixed. The "inner" limitation varies from 5 lb. to 120 lb. according to the relatively dangerous

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CASE FOR TRANSPORT OF GUNCOTTON "PER RAIL."

It must invariably be labelled in the manner shown, whilst the thickness of the wood composing the box, its strength, dimensions, &c., are inflexibly determined beforehand.

nature of the commodity, whilst an "outer" packing should not contain more than 200 lb.

Certain large manufacturers of explosives are allowed some little latitude, but even this is defined very clearly. On arrival at the railway depôt for loading, special vans are provided, made entirely of steel, and marked "Gunpowder Van" in 6-inch white-paint letters. The floor of each is composed of sheet lead, whilst the sides, ends and doors are lined with similar material, secured by copper rivets. Unventilated and guaranteed dust proof, the vehicles should never be used for anything other than explosives, and each is provided with a pair of padlocks to secure either door, together with a pair of boots. This footgear is made of solid rubber, and before anyone may enter the van he must slip them on over his ordinary wear, so that there shall be no risk of sparks flying from hobnails, &c. Dishonest loaders, knowing the high value of these rubber boots, sometimes steal them, and the same fate befalls the locks which, being of necessity good, strong and expensive, are very popular amongst a certain type of railwaymen because of the excellent security they afford to greenhouses, fowl-places, &c! It is very difficult to trace the thieves, and unfortunately they are not often brought to justice, so that the cost of supplying new locks and boots to gunpowder vans may make a considerable difference to the debit side of a railway company's annual balance sheet.

No two classes of explosive are ever loaded in the same van lest perchance the oscillation of transit should bring them together, for it is a well-known scientific fact that such contact might produce either a conflagration or some other equally disastrous eruption.

In loading the van, each package is passed gently from hand to hand, a procedure seldom accorded to other commodities, as commercial men know only too well. Should the boxes be so heavy that some little dragging or rolling is inevitable, clean thick cloths or hides are first placed upon the ground so as to prevent friction or contact with spark-creating material.

In packing the van, great care must be exercised to place the boxes sufficiently close to ensure reasonable rigidity, so that there will be no bumping or falling when the truck commences to run. But on the other hand, the load must on no account be made tight, or every jolt and bump to the truck will run right through and jar every solitary ounce of the stuff within.

Before the loaders commence work, their boots are inspected, and if either nails or metal tips are suspected, stockinged feet become the order of the day. A search for matches is, of course, conducted at the same time, whilst from the moment the job commences no interruption or cessation is allowed on any pretence whatever. Until the last case is stowed away and the van locked up, no interference is tolerated from anyone. A stranger may not even approach to watch the work! The labels affixed to the loaded van are of a type entirely dissimilar to any others in use.

Equally stringent are the precautions taken in dealing with inflammable liquids. These are usually carried in specially-built tank wagons, consisting of a large oval or square tank fitted to a steel wagon underframe. The tank has a small dome, rather like that next the smoke-stack of a locomotive, and this screws on and off to allow the filling and emptying of the vehicle.

All carriage charges on these dangerous liquids must be guaranteed by the sender who also promises to pay the return-journey charges, together with any delivery or detention fees that may arise on the transaction.

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Then the loading must not take place within 20 yards of even the smallest flame, whilst about 7½ per cent. of the tank must be left empty in order to provide air-space that will prevent the liquid becoming unduly heated.

After arrival at destination, 5s. per ton per hour is charged to the consignee for the time he allows to pass before taking away the commodity after the expiration of the first six hours. This is to cover and insure the risk taken by the railway company in keeping the stuff hanging about their premises.

Very detailed are the instructions to be observed by the railway servants concerned in the movement of the tanks or vans from place to place. Not more than five vehicles, either of explosives or other dangerous goods, may be attached to any one train or worked to any particular railway depôt, at one time, unless by the written request of the War Office or Admiralty, who then undertake liability for any mishap that may occur.

The guard of the train is forbidden to have in his van a fire, no matter how cold the weather. If he already has one alight, it must be put out, so that it is not difficult to judge of his feelings when unexpectedly attaching explosives in mid-winter! The engine-fire cannot, of course, be extinguished, but to minimise the risk from flying sparks, the vans, &c., are placed at the rear of the train. Seeing that every pound of explosive is protected by an "inner" and an "outer" packing, both impenetrable, and loaded in a locked, unventilated, guaranteed dust-proof van, or, if inflammable, contained in a sealed tank, such precautions do seem rather superfluous, but after all there is no harm in making assurance doubly sure!

At every stopping place the guard examines each axle to make sure the boxes are not running hot, and before he detaches any tank or van he must first find the agent in charge of the siding or depôt and make him acquainted with the legacy that is being left behind.

And the poor shunter! In detaching trucks from one train to put them on another he loves to hear the clink-clink-clink of buffers as he rushes through with the job. But if he or anyone else hears the clink-clink of buffers belonging to a tank or gunpowder van there is the possibility of a criminal prosecution later on!

SHUNTING AND TRAIN STAFF AT A RAILWAY DEPOT.

For conveying liquids, explosives and chemicals in small quantities, the regulations are more strict than ever. In the possession of every railway official, great or small, are detailed descriptions of the packing-cases, &c., to be insisted upon for every individual item of over a thousand listed commodities. The magnitude of this precaution will be better understood when it is explained that the receptacle must answer different descriptions and tests for almost every class of article!

The object of this complication is to keep the commodities from contact one with another, and to keep the distinction between each two obvious even to the newest porter. For scores of commodities commonly carried by rail, innocent and harmless enough by themselves, have a deadly effect if they come into contact with certain of the one thousand! There-

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fore, chemists, scientists and other experts have endeavoured to draw up packing regulations adequate to provide against any possible circumstances.

But after all this has been done, certain of the railway companies still consider the risk too great. The Great Western, for instance, will carry neither explosives nor explosive empties to or from any point that necessitates passing through the Severn Tunnel. The Metropolitan, too, prohibit the transport of explosives and inflammable liquids through their tunnels, whilst the Furness Company will carry nothing at all of a highly inflammable nature. And no company in the kingdom will agree to have more than 10,000 lb. packed into any one vehicle, nor more than 50,000 lb. at one place at one time!

FULL SPEED AHEAD!

A STRIKING VIEW ON THE LONDON MIDLAND & SCOTTISH RAILWAY.

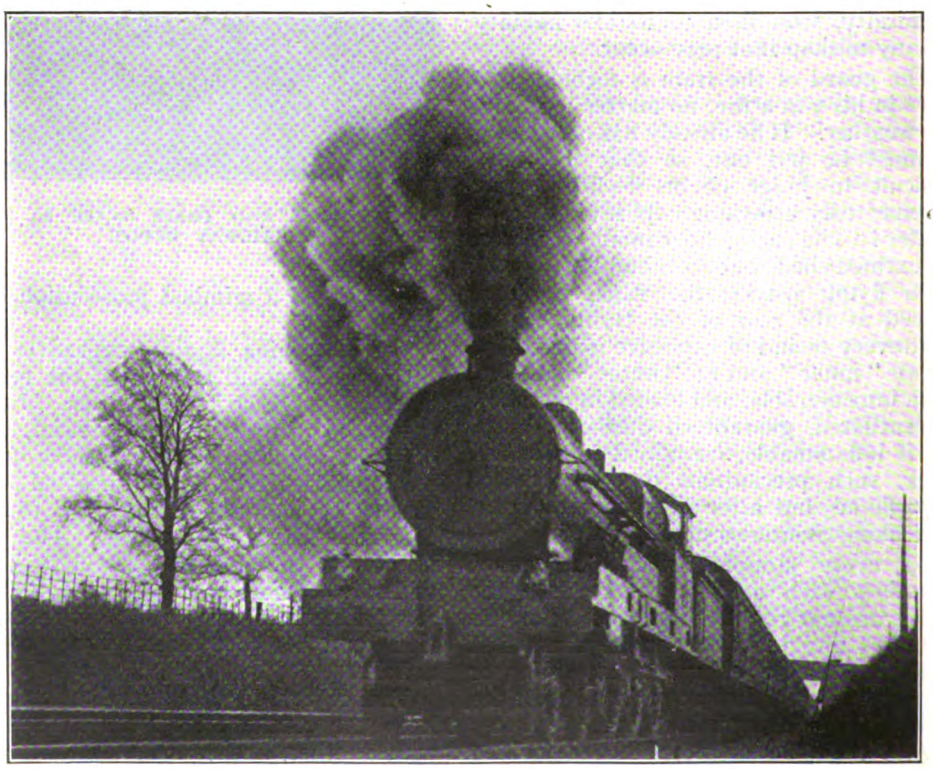

Photo.] EUSTON-GLASGOW EXPRESS NEAR BLETCHLEY. [*Chas. S. Lake.*

Speed about 70 m.p.h.

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"Halt" Traffic on the Great Eastern Section of the London & North Eastern Railway.

THE "halt" method of providing facilities for places between ordinary main and branch line stations, to be served by rail motor cars or motor trains, suffered a serious setback owing to the necessity for withdrawing so many facilities during the war period. In numerous cases such services have not yet been fully restored but the need for breaking up the frequently considerable distance between ordinary stations, especially in view of the growing tendency for motor road services to be introduced wherever there is any prospect of obtaining sufficient traffic, has caused the "halt" system to be further considered, in conjunction with alternatives to ordinary train operation, as a means for adding to public travel facilities, and at the same time meeting or improving upon competitive agencies. One method is that of the adapted motor omnibus or "rail-bus," setting down or picking up at certain level crossings or places where a public road enables convenient access to be given to the railway, whilst another method, on lines such as the Wisbech and Upwell Tramway and the Kelvedon and Tollesbury and Elsenham and Thaxted Light Railways, is by using specially adapted steam trains. But on the Wisbech line the vehicles are of tramway type, with suitable steps at the ends, while on the two light railways mentioned low platforms are provided.

In conjunction with the extending vogue of "conductor-guard" working, the Great Eastern Railway, towards the end of last year, added several new "halts" on various lines, with short platforms, as at Hockerill, on the Bishop's Stortford and Braintree line, and at Baron's Lane, between Cold Norton and Maldon West, on the Woodham Ferrers and Maldon line. Both of these have justified themselves, the latter especially, quite a large traffic having developed to and from Maldon, some abstracted from competitive motor omnibus services, but the major portion additional to the ordinary rail traffic of the branch and attributable mainly to the fact that facilities not hitherto available are now provided.

Developing this principle, the Great Eastern then introduced a new type of "halt," the cost of which is reduced to a minimum, in conjunction with special equipment of rolling-stock of a very inexpensive character.

On November 20, 1922, three of these new "halts" were brought into use on the Cambridge and Mildenhall branch, known as Fen Ditton, Exning Road, and Worlington Golf Links. These are located at road crossings, a short space alongside the line being cleared to form a "landing," but without raised platforms, and with a path to the public road. These are all on the same side of the line, and the branch set of vehicles, operated on the conductor-guard principle, has one vehicle equipped with a set of steps of special design adapted to be moved forward for use, or inwards, clear of station platforms, &c., when not required. The vehicle so fitted is labelled to indicate that "halt" passengers must travel in it, and is adapted for inter-communication between the compartments. Central corridor vehicles, with a connecting gangway for the use of the conductor-guard have been introduced.

Several other halts have since been provided, at Mill Road, Henham, on the Elsenham and Thaxted Light Railway, Stane Street, between Bishop's Stortford and Takeley, and at Bannister Green, between Felstead and Rayne, on the Bishop's Stortford and Witham line, opened Monday, December 18; and at Seven Hills, between Ingham and Barnham, on the Bury and Thetford line, and Yaxley, on the Mellis and Eye branch, opened on Wednesday, December 20.

These new facilities, provided at very low cost, should add very greatly to the convenience of travel, in that they

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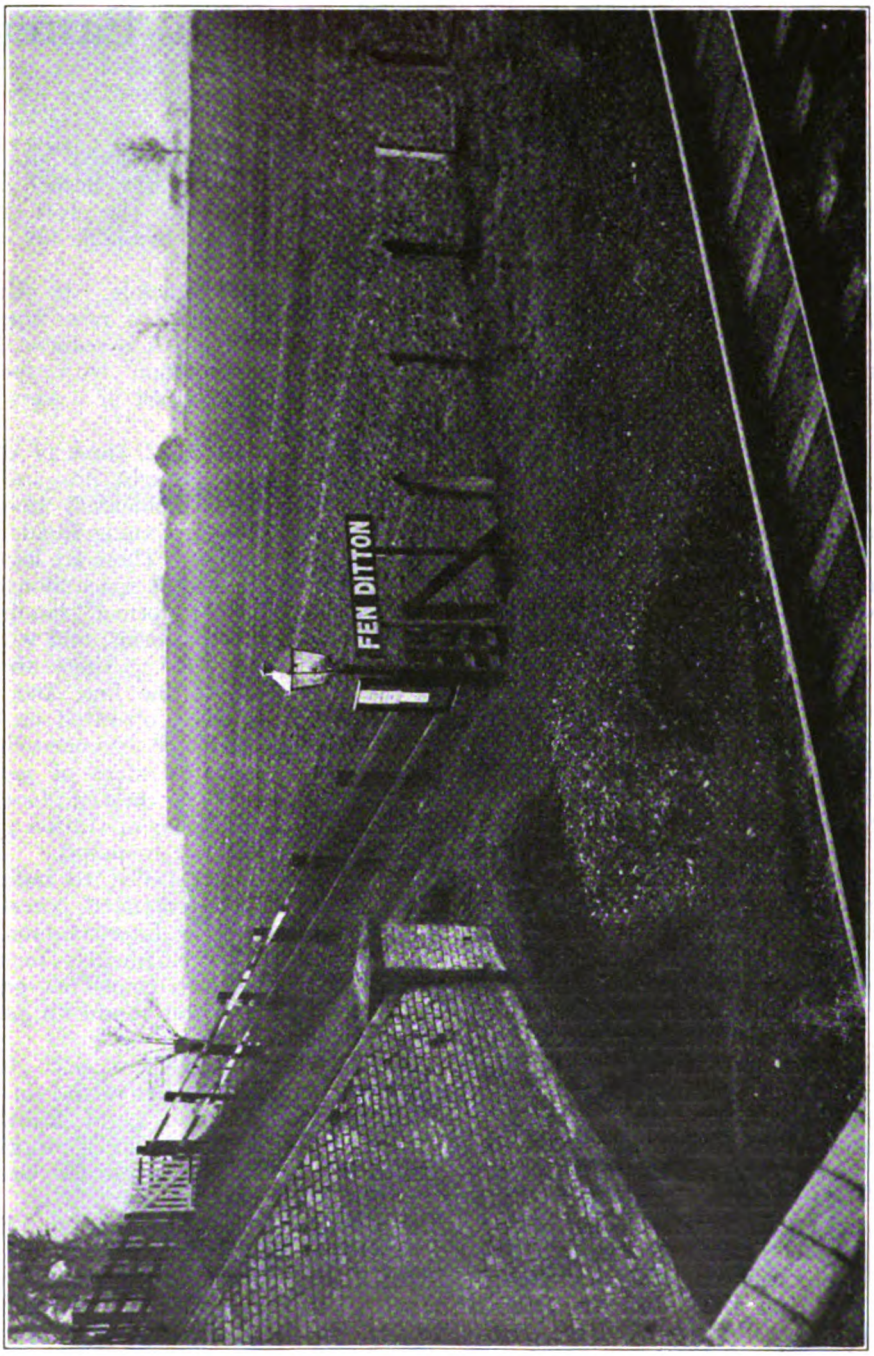

FEN DITTON—A NEW RAIL LEVEL HALT.

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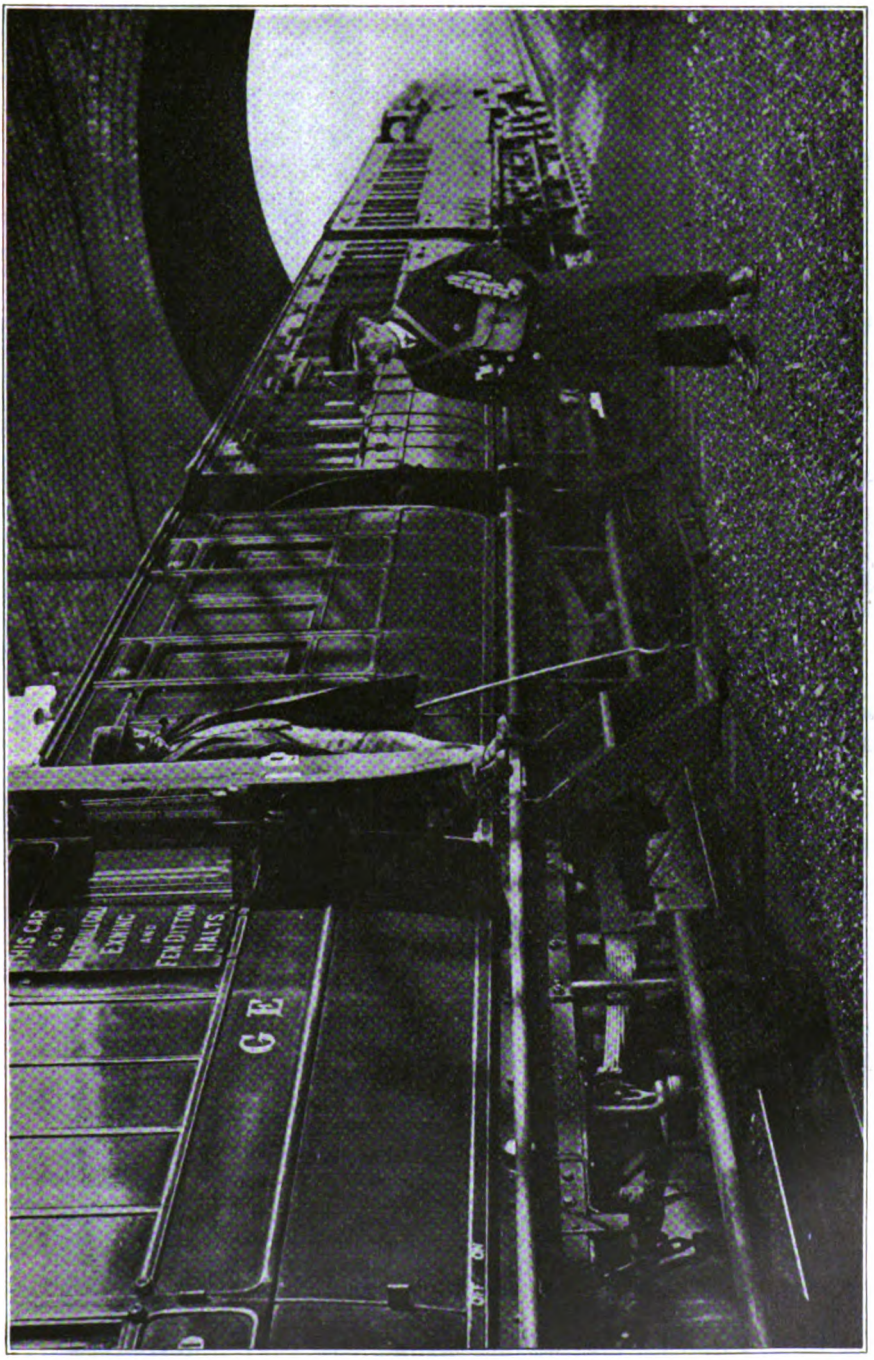

ADJUSTABLE STEPS ARRANGED FOR ALIGHTING PASSENGERS.

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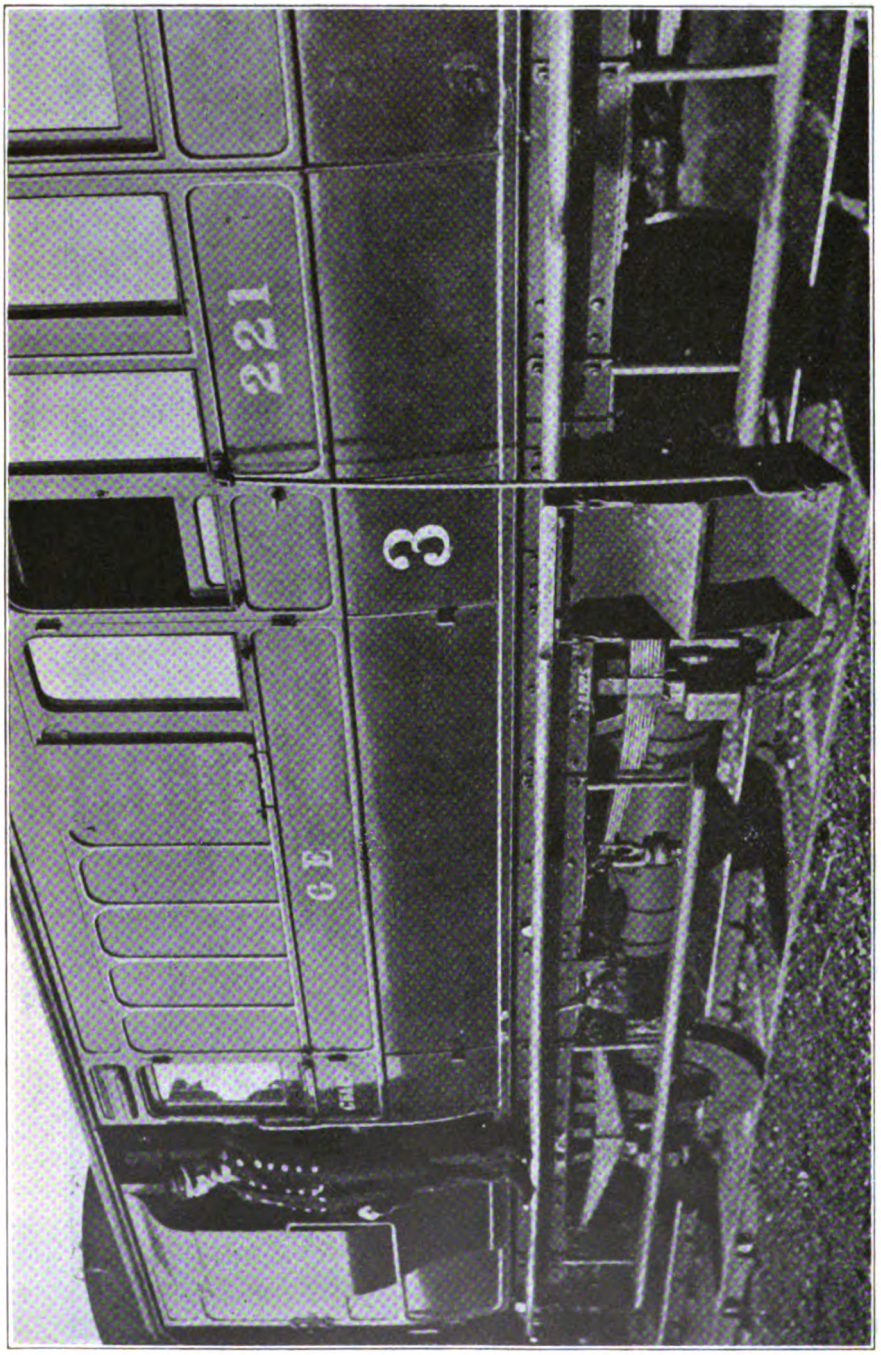

STEPS IN "RUNNING" POSITION.

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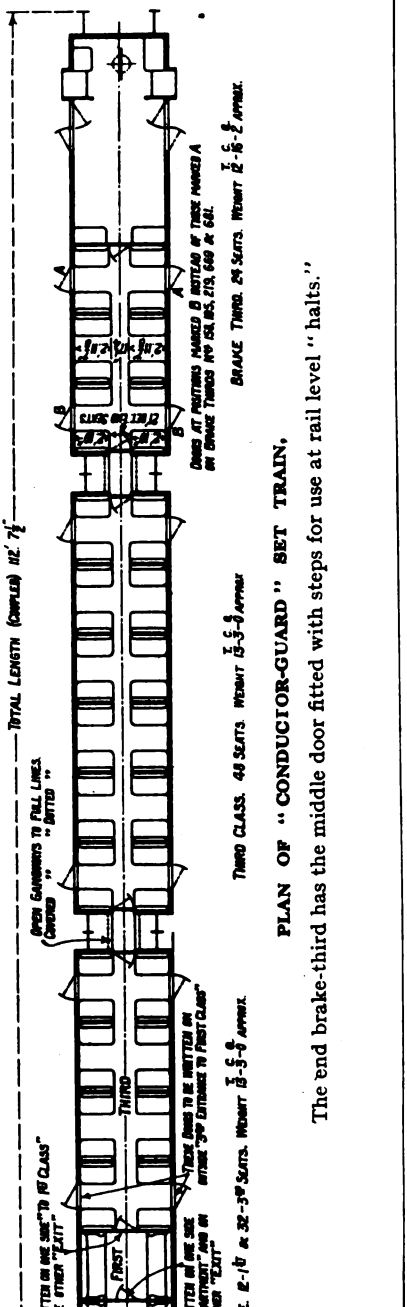
bring within easy reach many villages which have hitherto suffered because, although the railway passed close by, the nearest station was a mile or more away.

On certain sections where the "conductor-guard" is employed to issue tickets on the train, two or three standard corridor vehicles with connecting gangways are used, but in the ordinary way, special sets, generally corresponding to those introduced some years ago for use on the Kelvedon and Tollesbury and Elsenham and Thaxted Light Railways are used. The new sets, although consisting of adapted 6-wheeled vehicles, include a number of improvements and provide a very convenient and compact form of train, well designed and upholstered and fitted in accordance with present standard practice.

By courtesy of Colonel H. H. Mauldin, Superintendent of Operation, and Mr. A. J. Hill, Chief Mechanical Engineer, and their assistants, we are able to give a plan of one of the new "conductor-guard" sets. These differ from the light railway sets in that first-class accommodation is provided as well as third. For the former two compartments, each seating six passengers are provided, the seats being arranged longitudinally and public entrance being obtained through the adjacent third-class door, which is lettered "3rd entrance to First Class," the compartments being then reached through ordinary interior doors. The remainder of this vehicle is of semi-open type, with eight seats arranged back to back on either side of a central passageway, and accommodating altogether 32 third-class passengers. Only the doors of the end sections are used. A second vehicle provides for 48 third-class passengers, and is semi-open throughout with a central passage-way, and the end doors only retained. The third vehicle is also for third-class passengers, and is semi-open, in three sections, the centre door being fitted, where used for serving the new "halts," with steps on one side, as already described above. The remainder of this vehicle provides guard's and brake accommodation. The vehicles of each set are connected by simple gangways, with protecting rails intended for the use of the guard only, to enable him to proceed through the train and issue


TOTAL LENGTH (COUPLED) 112' 7½"
OPEN GANGWAYS TO FULL LINES.
CONNECTED "
FITTED "
DOOR TO BE WRITTEN ON ONE SIDE "TO 1ST CLASS" AND ON THE OTHER "EXIT"
FIRST
SMOKING
FIRST
THIRD
DOOR TO BE WRITTEN ON ONE SIDE "TO SMOKING COMPARTMENT" AND ON THE OTHER "EXIT"
THESE DOORS TO BE WRITTEN ON OUTSIDE "3RD ENTRANCE TO FIRST CLASS"
COMPOSITE. 12-1ST & 32-3RD SEATS. WEIGHT 15-5-0 APPROX.
THIRD CLASS. 48 SEATS. WEIGHT 15-5-0 APPROX.
DOORS AT POINTING MARKED B INSTEAD OF THOSE MARKED A ON BRAKE THIRDS NOS 158, 215, 669 & 681.
BRAKE THIRD. 24 SEATS. WEIGHT 12-16-0 APPROX.

PLAN OF "CONDUCTOR-GUARD" SET TRAIN.

The end brake-third has the middle door fitted with steps for use at rail level "halts."

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tickets. Further vehicles are, of course, added when necessary, and, when required, luggage, milk, or other vans can be attached. As newly adapted and upholstered, the accommodation is quite up to modern standards.

Notices are provided inside vehicles on the branches concerned, stating that "Passengers for ——— Halt (or Halts) must not attempt to alight until the steps have been fixed and the guard has opened the door." The brake third vehicle so adapted is also labelled for the use of passengers at the halt (or halts) named."

We are indebted for photographs reproduced to Messrs. S. Jenkinson and C. Richardson.

HEAVY FREIGHT TRAFFIC ON THE VICTORIAN GOVERNMENT RAILWAYS.

Mr. C. D. GAVAN DUFFY, of Melbourne, sends several photographs, one of which is reproduced, showing one of the recently constructed 2-8-0 superheater locomotives of class "C," built to deal with heavy freight traffic on the various main lines approaching Melbourne. They are used particularly between Melbourne and Bendigo, and Melbourne and Seymour, both congested routes, especially while the wheat is coming down. The new engines have reduced double heading very considerably. For instance, between Bendigo and Woodend, double-headed trains were restricted to 55 vehicles, whereas the new locomotives can take 75 wagons unaided.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A. M.Inst.T., A.I.Loco.E.

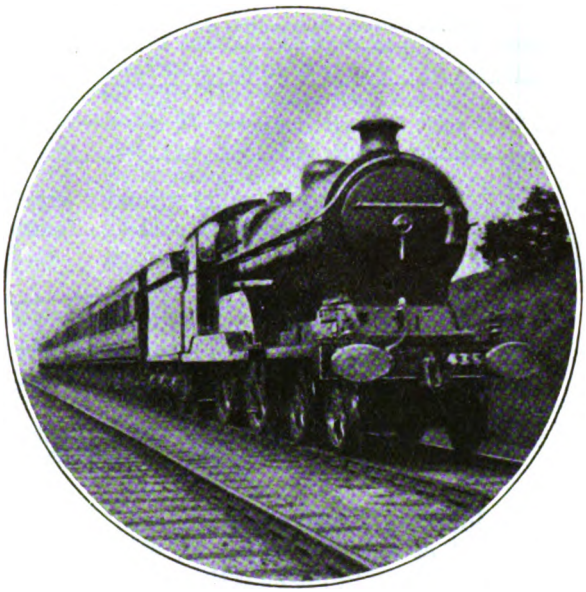

Photo.] [*W. Carter.*

LONDON & NORTH EASTERN RAILWAY.

Newcastle–Swansea express near Nottingham.
Great Central 4-4-0 locomotive No. 435, "Sir Clement Royds."

IT is my privilege in the present and subsequent articles to set before readers a truly astonishing series of speed exploits by British locomotives. All of them are of recent date, and the moral that they point, and point clearly, is that, with the perfectly free and efficient running of modern superheated piston-valve engines at high speeds, there is no need for our post-war speed recovery to stop at pre-war figures. By the time that these lines are in print, or immediately afterwards, substantial accelerations may possibly have taken place on the London Midland and Scottish and London and North Eastern lines, bringing most of the chief competitive services back finally to their pre-war times, but from such records as follow, there seems ample justification for further accelerations still. It appears to me that, in course of time, as aerial travel gradually develops and increases in reliability as a means of transport, railways may be forced to schedule very high speed trains in self-defence. Why not anticipate this competition by high speed extra-fare trains, and so carry the war into the enemy's camp?

For the chief of the speed achievements which follow I am indebted to the courtesy of correspondents, and I may say in advance that each of the correspondents concerned is one on whose figures complete reliance may be placed. This is especially the case with the Great Western runs embodied in the first table. The minute accuracy of record undertaken by the friend who was fortunate enough to "clock" the first two runs in this table is such as to put my own modest timing efforts to the blush; he records every mile-post *en route*, together with half and quarter-miles over critical sections with a split-second chronograph, in addition to taking times at stations and certain intermediate points with another chronograph as a check, and subsequently scrutinises his figures with the most lynx-eyed caution with a view to the discovery of possible errors.

The first of the three runs was described in the July issue of last year, in company with the record-breaking achievements of the Great Western which took place in the years 1903 and 1904; the second run in the table is a fitting "foil" to the first, and my friend—Mr. Humphrey Baker, of Bath—has very kindly prepared, as before,

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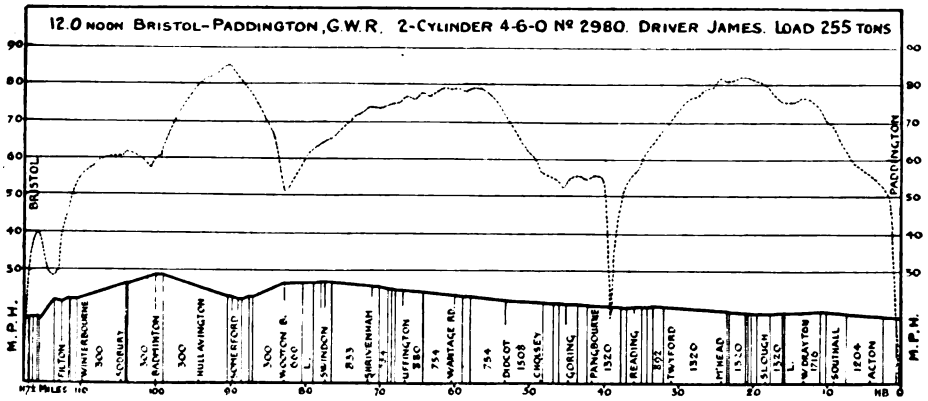

GRADIENT PROFILE AND SPEED CHART, BRISTOL TO PADDINGTON, GREAT WESTERN RAILWAY.

a beautifully executed graph, which is reproduced in the present article, of the speeds maintained throughout the journey. The third run is one of my own, recorded just at the time of writing, and was made on the 5 p.m. from Bristol to London, instead of the 12 noon train, as in the other two cases; we were specially stopped at Badminton in order to pick up the Duke of Beaufort, but despite a dead stand there of 65 sec., signals on at Steventon, a bad p.w.r. check beyond Pangbourne, and the usual slack made by this train at Reading for the purpose of slipping a coach on the platform road, we dropped only 3 min. on schedule time.

It will be remembered that the leading feature of my friend's first run, beyond the maximum speed of 84 m.p.h. attained at Little Somerford, was the extraordinary going from Didcot onwards, the 31 miles between posts 49 and 18 being run in 24 min. 48 sec., at an average speed of 75 m.p.h. throughout; the 70 miles from post 78 to post 8 were covered in 20 sec. under the even hour, and 57 individual miles of the journey were reeled off at speeds of 70 m.p.h. or over. But though there was not, on the second run, the same continuity of exceptional speed, on account of intermediate checks, nearly all the individual records were higher.

In fact, so far as records are concerned, whereas the first run, with its magnificent running, only beat the summary of "fastest" times (given in an analysis of 26 runs on these trains, which appeared in the same article) over one section of the journey—from Reading to Maidenhead, where the previous "bogey" of 10 min. 15 sec. was cut to 9 min. 19 sec.—the second run cuts below "bogey" over no less than *five* stretches of line! The 14 min. 15 sec. from Badminton to Wootton Bassett was clipped to 13 min. 58 sec.; the 19 min. 43 sec. from Swindon to Didcot to 19 min. 30 sec.; the 10 min. 15 sec. from Reading to Maidenhead to 9 min. 59 sec.; the 4 min. 45 sec. from Maidenhead to Slough to 4 min. 19 sec.; and the 7 min. 45 sec. from Slough to Southall to 7 min. 30 sec. The first and second runs combined, indeed, would have curtailed that summary of fastest times from 107 min. 45 sec. to 105 min. 40 sec. for the 117·6 miles, and if, as my friend points out, we add *Cœur de Lion's* 63 min. 1 sec. from Bristol to Didcot and 28 min. 43 sec. from Twyford to Paddington, to *Stanford Court's* 17 min. 48 sec. from Didcot to Twyford, we get the astonishing total of 109 min. 32 sec. from Bristol to Paddington out of these two runs alone, in spite of *Cœur de Lion's* very leisurely approach to the terminus.

There is not much to add by way of description to the tabular statement, wherein I have set out both times and maximum and minimum speeds attained on each run. *Cœur de Lion* did nothing exceptional in the earliest stages, up the 1 in 75 to Filton, but the acceleration up the 1 in 300 from Stoke Gifford was very fine, speed rising to 56½ m.p.h. as early as Winterbourne, and still increasing steadily until the mile-a-minute rate was

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just passed at Sodbury, and the maximum attained was 61½ on the short level over the troughs; after this speed dropped to a minimum of 57½ at the east end of Sodbury Tunnel. Then followed a tremendously high burst of speed down the 1 in 300 from Badminton to beyond Little Somerford, whereby the 8 miles between posts 96 and 88 were run in 5 min. 54·6 sec., at an average of 81·2 m.p.h., and with a maximum of 84·9 m.p.h. In consequence of this the train was actually 3¼ min. early at Wootton Bassett, but the driver did not let this influence his rate of progression in the slightest, as on the faintly falling grades from Shrivenham to Didcot, averaging 1 in 800, he worked up gradually to 79 m.p.h. This speed was

GREAT WESTERN RAILWAY: BRISTOL–PADDINGTON.

Engine: 2-cylinder 4-6-0— No.:			2949			2980			2918		
Name:			*Stanford Court*			*Cœur de Lion*			*Saint Catherine*		
Load, tons tare			252			242			¶252		
,, ,, full			265			255			¶265		
Distance.	Stations.	Schedule.	Times.	§Speeds.	Times.	§Speeds.	‡Speeds.	Distance.	Times.	§Speeds.
ml. ch.		m.	m. s.	m.p.h.	m. s.	m.p.h.	m.p.h.	ml. ch.	m. s.	m.p.h.
0 00	Bristol .. .. dep.	0	0 00	—	0 00	—	—	0 00	0 00	—
1 56	Stapleton Road pass	—	4 04	—	4 25	—	23·0	1 56	4 15	39
4 64	Filton Junction ,,	9½	9 55	28½	10 06	28½	32·7	4 64	10 15	26
			p.w.s.	20					p.w.s.	20
7 63	Winterbourne ,,	—	14 02	52	13 54	56	47·1	7 63	14 35	50½
13 05	Sodbury .. ,,	—	19 55	58½	19 16	61½	58·9	13 05	20 40	56½
17 50	Badminton { arr.	pass	pass		pass			17 50	26 05	55†
	{ dep.	25	24 46	56½	23 49	57½	60·1	0 00	0 00	—
23 31	Hullavington .. pass	—	29 42	79	28 43	80½	70·5	5 61	7 30	68
27 71	Little Somerford ,,	—	32 59	84	31 59	85	82·5	10 21	10 50	76½
30 50	Brinkworth .. ,,	—	35 03	76½	34 02	78	81·2	13 00	13 30	—
34 59	Wootton Bassett ,,	41	39 01	*38½	37 47	*51½	65·7	17 09	17 45	*50
40 27	Swindon .. ,,	47	45 58	55½	43 31	64½	58·5	22 57	¶23 30	64
46 07	Shrivenham .. ,,	—	51 36	66	48 30	74	69·2	28 37	28 50	66
51 08	Uffington .. ,,	—	56 04	70	52 35	76½	73·6	33 38	33 25	67
53 43	Challow .. ,,	—	—	—	54 38	77½	77·5	35 73	35 40	70½
57 19	Wantage Road ,,	—	61 09	75	57 22	79	76·6	39 49	38 35	74
									sigs	45
61 09	Steventon .. ,,	—	64 17	73	60 19	79	78·8	43 39	42 20	—
			signals	slight	engine	eased				
64 41	Didcot .. .. ,,	68	67 15	—	63 01	72	75·5	46 71	45 50	70½
69 14	Cholsey .. ,,	—	71 17	72	67 26	61	63·3	51 44	49 40	72½
72 71	Goring .. .. ,,	—	74 18	76	—	—	—	55 21	52 40	74
76 08	Pangbourne .. ,,	—	76 51	76½	74 59	52½	55·5	58 38	55 20	74
					p.w.s.	15			p.w.s.	30
79 00	Tilehurst .. ,,	—	79 05	78	79 28	—	38·6	61 10	58 40	56½
81 53	Reading .. ,,	84	81 09	78	82 43	55	49·1	64 03	¶61 50	*40
86 50	Twyford .. ,,	—	85 03	76	87 24	69	63·5	69 00	67 10	69
93 32	Maidenhead .. ,,	94	90 28	74	92 42	81½	76·7	75 62	72 45	74
99 15	Slough .. .. ,,	100	95 17	72	97 01	80	80·4	81 45	77 30	75
104 33	West Drayton ,,	—	engine	eased	101 06	75	76·7	86 63	81 45	71½
108 45	Southall .. ,,	109	103 47	60	104 31	69	72·8	90 75	85 15	74
					engine	eased			engine	eased
111 73	Ealing .. .. ,,	—	—	—	107 46	59	61·8	94 23	88 05	65
113 30	Acton .. .. ,,	—	signal	checks	109 22	55½	—	95 60	89 25	62½
116 31	Westbourne Park ,,	—	—	—	112 50	—	53·0	98 61	92 50	—
117 51	Paddington .. ,,	120	118 23	—	116 07	—	22·7	100 01	95 50	—

* Service slacks. ¶ Reduced by slips to 224/235 tons from Swindon, and 191/200 tons from Reading. § Maxima and minima, by chronograph, at or near the stations shown.
‡ *Average* speeds from station to station. † Speed before shutting off steam.

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reached at Wantage Road, and also at Steventon (a strongish side-wind occasioning slight fluctuations of the rate intermediately), the average speed between posts 65 and 55 being 78·0 m.p.h.; post 57, 60·6 miles from the start, was passed in 59 min. 57 sec.

Passing Didcot *five minutes early* (on a Bristol two-hour train!) it was clearly time now to ease the engine, and such an easing took place that at Pangbourne speed had fallen to 52½ m.p.h., after which came a very severe p.w.r. check. But once again the engine got away at a tremendous speed, easily at first, and then at a truly thrilling rate from Twyford onwards, whence the mile-post timings read as follows:—

Mile-posts, ex-London—	Time ex-Bristol. min. sec.	Speed. m.p.h.
31 (Twyford)	87 23·8	—
30	88 14·2	71·4
29 (obscured)	—	—
28	89 49·8	75·3
27	90 36·8	76·5
26	91 22·6	78·6
25	92 8·2	78·9
24	92 52·4	81·4
23	93 37·2	80·3
22 (obscured)	—	—
21	95 5·6	81·4
20	95 49·8	81·4
19	96 34·4	80·7
18	97 19·4	80·0
17	98 5·8	77·5
16	98 53·6	75·3
15 (obscured)	—	—
14	100 29·4	75·1
13	101 16·6	76·2
12	102 4·0	75·9
11 (Hayes)	102 52·4	74·4

Average speed for this 20 miles of practically dead level track was thus no less than 77·5 m.p.h., and it seems clear from the running over the other parts of the journey that such a speed could have been maintained indefinitely. Some other statistical figures in regard to this perfectly astounding run are given herewith:—

	Mile-posts.	Miles.
Individual miles run at	94½—88½	6
80 m.p.h. and over	25—18	7
Total		13
Individual miles run at	96—87	9
75 m.p.h. and over	67—54	13
	29—12	17
Total		39
Averaged 80 m.p.h.—	Mile-posts.	Miles.
In 7 min. 29 sec.	96—86	10
In 7 min. 29 sec.	27—17	10
Total		20
Averaged 75 m.p.h.—		
In 12 min. 48 sec.	100—84	16
In 17 min. 33 sec.	73—51	22
In 19 min. 53 sec.	33—8	25
Total		63

Sixty-three miles out of one single journey at an average speed of seventy-five miles an hour! Words really fail one in the matter of adequate comment on such a performance, and it is a matter for congratulation that so careful an observer as Mr. Baker, who tells me that he recorded no less than 171 passing times in the course of the journey, was a passenger by the train. No communication of any sort was made to Driver James, who was the responsible authority on the footplate, before the commencement of the run, and if any such communication had been made it would in no way have detracted from the unique character of the running. I should think it a fairly safe proposition that, for high speed travelling with moderate loads on a level track, these two-cylinder 4-6-0's on the Great Western have no rivals, not only in the British Isles, but the world over. It is impossible to lay down a net time for this journey from Bristol to London, but as the 75 m.p.h. rate could have been sustained with perfect ease between Didcot and Twyford, the end-to-end time equivalent to the general running would be somewhere in the neighbourhood of 109 min. for the 117·6 miles.

Naturally my own run is to a certain extent eclipsed by the one just described, although *Saint Catherine* put up some exceedingly fine work, especially on the London side of Didcot. The evening train rarely gets so good a road as the midday "flier," and in addition to the extra stop at Badminton, which made us 4 min. "down" at Wootton Bassett, we got signals on at Steventon (Didcot seems completely reformed nowadays, but there are still troubles at times in the vicinity) and the bad relaying slack at Pangbourne, precedent to the usual slowing through Reading. To pick up a minute from Wootton Bassett to Paddington, in face

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of these disheartening hindrances, was very creditable.

There was little of note on the earlier part of the run, the speed recoveries both from Badminton, down the 1 in 300, and also from Wootton Bassett, being disappointingly slow—by Great Western standards, that is to say!—but the accelerations from Steventon check, whereby in 3½ miles of level track we went up from 45 to 70½ m.p.h., and also from Reading to Twyford, were extraordinarily rapid. Between Goring and Pangbourne we ran steadily at 74 m.p.h., and then from Twyford to Southall, where the rate of progression was materially slowed, we maintained an average of 72·8 m.p.h. for some 22 miles. Net time from Bristol to London I should put at about 116¾ min., allowing 1 min. each for the Steventon and Pangbourne checks, and 4¼ min. for the Badminton stop, but nothing, of course, for the customary slack at Reading. Net time from Badminton to Paddington was 93¾ min. for the 100 miles, including Reading slack, or about 91½ min. for an unchecked journey.

For the next selection of flying feats we pass northwards to the North Eastern area of the London and North Eastern Railway, of which once again I have been fortunate enough to see a good deal in recent months. And, needless to say, the train concerned is the Glasgow to Leeds "diner," which is booked to cover the 44 miles 10 chains from Darlington to York in 43 min., start-to-stop. This is a considerably stiffer task than it was in the days before the war. The old 12.20 p.m. from Newcastle to Sheffield carried an average of five or six non-corridor vehicles, weighing at most 135 to 165 tons gross; to-day the minimum load is a six-coach dining car set which tares 185 tons, *plus* a bogie brake-van running through to the Great Central line, the whole weighing some 215 to 220 tons with passengers and luggage. With extra stock in the summer the total is nearer the 300 mark.

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

South Wales Restaurant-car Express. Two cylinder 4-6-0 locomotive No. 2909, "Lady of Provence."

Further, as the approach to York is for the major part of the year made after dark, the running in from Poppleton Junction through to the South end at York must be considerably steadier than it was in the old days, as much as a minute or even more being lost in this way. On so tight a booking over so short a distance, these hindrances obviously entail harder work and considerably higher speeds over the main portion of the run, if time is to

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be kept. Truth to tell, the schedule has been somewhat of a "paper" one from its restoration up to the present time. Out of six journeys I have made on the train, on one only did we actually keep time, and then we improved on it. On another —the most recent—we should have improved on it still further, but for being stopped by signal at Tollerton, on account of the late running of the second mail—the 7.15 p.m. from Newcastle to York—which has a margin of only 8 min. in front of the "flier," and is a frequent obstruction.

On my first trip, with a "Z" class 4-4-2, we lost 4 min. without apparent reason; on the second, with an old original "V" class "Atlantic," we all but kept time, dropping only ¾-min.; on the third, with a "V" of the second batch, obviously in poor condition, we lost 8 min.; and on the fourth, again with a "Z" and for no reason that I could fathom, we were nearly 3 min. down. At this stage I lost heart (as the train on its present timing is by no means an easy one to fit in with one's travelling arrangements), until the magnificent effort timed by a Newcastle friend, and reproduced herewith in column 6 of the second table, reached me by post, and I resolved to "try again," with the happy results about to be described.

The table commences with the classic run made by Driver Watson, of Gateshead, on the pre-war train, which has on several occasions received mention in these columns, and constitutes a species of "bogey" for the course. Its chief features were the marvellous start, whereby a speed of 67 m.p.h. was attained from rest along 3 miles of dead level track, and was further increased to 69 up 2¼ miles at 1 in 356-377 to Eryholme. After that the sustained maxima were 77½ m.p.h. at Thirsk, and 76½ at Alne, and York was reached in 39 min. 34 sec.—an actual time which has never yet been surpassed, to my knowledge, even by a "Z," at least under the observation of a competent recorder. No. 2 run, behind a newly-superheated "R" class 4-4-0, has also figured more than once in these articles, and claims notoriety on account of the maintained rate of 80½ m.p.h. for 4 miles continuously on the level beyond Tollerton —the only occasion on which I have known the "80" mark reached on a level track on any line other than the Great Western.

Then we come to the post-war runs. I have only included No. 3, which was

Photo.] GREAT WESTERN RAILWAY. [*F. Horder.*

Up "Cornish Riviera" express entering Exeter (St. David's) Station.
Two-cylinder 4-6-0 locomotive No. 2917, "Saint Bernard."

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achieved by an engine of a class in no way addicted to extreme feats of speed, and which I have never previously known used on this train, on account of the pluckiness of the attempt. The start out to Croft was the fastest of any of the "Atlantic" trips; then we maintained of 72½ at Alne. For the type of engine, a loss of only ¾-min. on schedule was commendably small.

Now we come to the recent time-keeping "Z" journeys, on which some very high speed was developed; strangely enough, although on all three the rate at

LONDON AND NORTH EASTERN (NORTH EASTERN) RAILWAY.
DARLINGTON–YORK.

Distance.	Run No. .. .. / Engine No. .. .. / ,, type .. .. / ,, class .. .. / Driver .. .. / Load (axles) .. .. / ,, (tons tare) .. / ,, (tons full) ..	Schedule.	1 / 1672 / 4-4-0 / R / †Watson / 24 / 152 / 170	2 / 1207 / 4-4-0 / R(S) / 20 / 123 / 135	3 / 1794 / 4-4-2 / V(S) / 30 / 220 / 230	4 / 2208 / 4-4-2 / Z(S) / *Hardgrave / 30 / 209 / 220	5 / 2170 / 4-4-2 / Z(S) / *Bond / 30 / 206 / 215	6 / 2172 / 4-4-2 / Z(S) / *Watson / 30 / 204 / 215	7 / 2164 / 4-4-2 / Z(S) / *Linfoot / 50 / 345 / 365
m. ch.		m.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
0 00	Darlington	0	0 00	0 00	0 00	0 00	0 00	0 00	0 00
2 48	Croft Spa	—	3 54	4 30	4 30	4 40	4 30	4 40	4 50
5 18	Eryholme	—	6 14	7 10	7 15	7 25	7 15	7 03	7 40
6 74	Cowton	—	7 40	8 45	9 00	9 05	8 55	8 38	9 30
10 32	Danby Wiske	—	10 33	11 35	12 15	12 00	11 55	11 33	12 45
14 14	Northallerton	15	13 46	14 45	15 45	15 15	15 10	14 45	16 20
17 46	Otterington	—	16 36	17 40	19 00	18 10	18 00	17 40	19 25
21 74	Thirsk	23	20 04	21 05	22 50	21 45	21 30	21 05	23 05
26 10	Sessay	—	23 33	24 35	26 35	25 15	24 40	24 35	26 45
28 04	Pilmoor	—	25 09	26 10	28 15	26 50	26 10	26 05	28 25
30 60	Raskelf	—	27 23	28 25	30 40	29 00	28 20 sigs	28 10	30 45 sigs
32 75	Alne	32	29 09	30 05	32 25	30 40 sigs. slt	30 05 sigs	29 45	33 00
34 31	Tollerton	—	30 20	31 15	33 45	31 50	32 25 / 33 35	30 55	
38 50	Beningbrough	—	33 45	34 30 p.w.r.	37 20	35 20	39 35	34 12	
41 00	Skelton Bridge Box ..	—	35 40	37 30	39 25	37 15	41 50	36 07	
42 43	Poppleton Junction ..	—	37 00	40 00	40 45	38 35	43 10	37 27	
44 10	York	43	39 34	42 50	43 45	41 45	46 20	41 25	
44 10	Net times (min.)¶ ..	43	39½	40¼	43¼	40¾	40¼	40	43½
21 04	Otterington to Beningbrough Time ..		17 09	16 50	18 20	§17 00	§16 22	16 32	§17 55
	Otterington to Beningbrough Av. speed		73·6	75·1	68·9	74·3	77·2	76·4	70·5

¶ Net allowance based on finishing time of Run No. 1, Skelton Bridge to York.
† Gateshead Shed. * York Shed. (S) Superheater engine. § Net times.

56½ m.p.h. from Croft up to Eryholme, but did poorly on to Northallerton, only touching 67 at Danby Wiske, and falling to 60 on the level at Northallerton; but after that the going was excellent, and from Otterington to Skelton Bridge speed never fell below 69 m.p.h., a maximum of 71½ m.p.h. being reached at Thirsk and Raskelf, or just beyond, was over 79 m.p.h., the "80" line was not quite reached. I fancy it would have been on No. 5 run, as we were still inclined to accelerate as we approached Alne, had it not been for the disastrous signal check there, followed by the stop at Tollerton. On No. 4 run Driver Hardgrave accelerated to 58½

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m.p.h. at Croft, and further, very slightly, to just over 59 at Eryholme; from there we drew rapidly up to 72½ m.p.h. at Danby, and after a minimum of 70½ at Northallerton, to 76½ at Thirsk. There was a slight falling away, as usual, to Sessay, where the rate was 72½ m.p.h., but thence we accelerated steadily to 75 at Pilmoor, 77½ at Raskelf, and 79 at Alne, which speed we might have maintained for some distance, but for the adverse signal at Tollerton. The check was very slight, but it was sufficient to bring us down to 72 m.p.h.; notwithstanding this, Hardgrave rapidly worked his engine up again to 75 m.p.h. at Beningbrough, and as much as 76½ between there and Skelton Bridge. An exceedingly careful approach to York concluded the run in exactly 41¾ min.; net time was 41½ min., and with such a finish as that of Run No. 1, the net start-to-stop time might have been 40¾ min.

On No. 5 journey, after a slighter slower exit from Darlington to Northallerton, Driver Bond drew clear away from Driver Hardgrave, with some finer running still. Speeds were 56½ m.p.h. at Croft and 58½ at Eryholme; 72½ at Danby and 70½ at Northallerton; 75 at Otterington, 79 at Thirsk, 75 from Sessay to Pilmoor, and 79 at Raskelf, after which came the unlucky delays previously referred to, culminating in a dead stand of 70 sec. at Tollerton. From this stop Bond accelerated his engine to 64½ m.p.h. in 4 miles of level track, and to 69 in just over 6 miles, the starting time of 9 min. 35 sec. for the 8·1 miles from Tollerton to Poppleton being in reality one of the finest feats of the journey. So the journey was actually completed in 46 min. 20 sec., check and stop included, or in a running time of 45 min. 10 sec.; net time was 40¾ min., and a finish like that of No. 1672 would have produced a net time of 40¼ min. It is interesting to note that on this run the speed was maintained at 75 m.p.h. or over for 15 miles—from Otterington almost to Alne—and here again it is clear from the free running of the engine that such a gait might have been continued for an indefinite distance.

Photo.] LONDON & NORTH EASTERN RAILWAY. [*W. Rogerson.*

Up East Coast express passing Cowton.
North Eastern three-cylinder 4-4-2 locomotive, No. 733.

My friend's journey, which succeeded in re-arousing my enthusiasm, appears in column 6. Watson was the driver—not Watson of Gateshead this time, but his namesake of York, as this train is now generally entrusted to York men, who take it a week at a time. I have it on good authority that Watson, favoured by good weather and an absence of signal

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checks, maintained closely similar times on practically every night of his week; certainly a "communication" had been made to him in advance on this occasion, as it had been to the drivers on the two runs just previously described, but there was no conversation with drivers on any of the other post-war journeys. Watson breasted Eryholme at 61½ m.p.h., and was doing 75 by the time he got to Danby; the figure at Northallerton is not mentioned in the log, but 77½ m.p.h. was the speed approaching Thirsk, where the engine was eased over the junctions to 68½ m.p.h. Thenceforward acceleration was the order of the day, to 77½ m.p.h. at Pilmoor, and 79·6 at Alne—so near 80, but not quite there!—and good speed was continued at Poppleton, whence the last mile into York was taken at a most exemplary rate of progression. On a pre-war arrival basis this was without question equivalent to a 40-min. run. The average speed from Cowton to Poppleton Junction—35 miles 49 chains—was 74·1 m.p.h. for the whole distance, on this magnificent run, and it is highly probable that Driver Bond would have reached the 75 average throughout, had he been afforded a clear road.

In the last column I have shown a run which was not made upon this train at all, but on the up evening "Scotsman" leaving Darlington at 5.23 p.m., and allowed 49 min. for the trip, or 6 min. more than the crack booking. The load was a substantial one of 50 axles, the full weight being quite 365 tons, and the surprising thing is that we left dead on time, so that there was not the slightest need for hurry. But the sight of any "Z" of the 2163-2172 batch—which have the reputation of being the best 3-cylinder "Atlantics" of the whole fifty engines, and confirm it by their consistently good running—always arouses pleasant anticipations, which No. 2164, under the able command of Driver Linfoot—another York man—in no way falsified. There was but little to distinguish the start from the 43-min. starts; we were doing 55 m.p.h. or just over from Croft to Eryholme, and reached 67 m.p.h. at Danby. Approaching Thirsk we were going at 72½ m.p.h., and after a brief interlude of 69 at Sessay, accelerated to 70½ at Pilmoor and 72½ again at Raskelf. But this was too good to last, as we were gaining substantially on time; sure enough, the "slow" ahead of us had not got clear from Alne on to the reception line, and in consequence we were brought to a sudden stand at one

Photo.] LONDON & NORTH EASTERN RAILWAY. [*Henry L. Salmon.*

Leeds–York express near Church Fenton.
North Eastern three-cylinder 4-4-2 locomotive No. 2207.

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of the automatic signals just short of Alne station. This was hard luck, although in the circumstances delay was a practical certainty; undelayed we could have reached York comfortably in 44 min., if not a shade less. Thus these North Eastern 3-cylinder "Atlantics" yield but little, if at all, to the Great Western 4-6-0's in the matter of sustained high speed on the level; a claim which is substantiated by a further log, which I have just received from my Newcastle friend at the moment of correcting the proofs of this article. It is unfortunately too late to include Driver Linfoot's effort on the "flier" in the table of runs in this article, but I hope to describe it in full next month. Meantime I would say that, with No. 2163 and 220 tons, after taking things easily to Northallerton (to avoid possible conflict with the mail), he maintained a speed of 75 m.p.h. and upwards all the way from Otterington to Skelton Bridge, 23½ miles; that an undoubted speed of 82 m.p.h. on the level was reached between Tollerton and Beningbrough; that the *average* speed from Otterington to Poppleton Junction was 77·5 m.p.h., from Thirsk to Beningbrough 78·8 m.p.h., and over 12½ level miles from Sessay to Beningbrough a shade in excess of 80 m.p.h. Such staggering achievements as these really leave the observer rather breathless!

What marvellous travelling times might be recorded were the "Race to Scotland" of 1895 repeated with the locomotives of to-day!

TO "THE GOLDEN WEST."

Photo.] [*E. A. Gurney Smith.*

11.0 A.M. PADDINGTON-PENZANCE EXPRESS, GREAT WESTERN RAILWAY, APPROACHING MARAZION.

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Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*Raymond Walker.*

St. Pancras–Manchester express passing Rowsley. Midland 4-4-0 locomotive No. 773.

Out-of-Course Stops by Standard Express Trains.

By G. A. SEKON.

"FIRST stop Headcorn" surprises the traveller who happens to be on the South Eastern and Chatham London Bridge station at 4.36 p.m. as a train runs in from Charing Cross. "Why ever is an insignificant village with less than 1,500 inhabitants, nearly 50 miles away, favoured with a non-stop express?" is the mental question he asks himself.

Main line trains may be classified in recognised divisions. There are the "special expresses," making long non-stop runs, such as those which do not call between Euston and Crewe; expresses that call only at important stations, Peterborough, Grantham, Doncaster, York, for example, on the erstwhile Great Northern Railway; the fast trains calling at, for instance, Surbiton, Woking, Basingstoke, Winchester and Southampton from Waterloo; and lastly there are the ordinary trains which call at almost every station.

Readers of the RAILWAY MAGAZINE who travel much, or study time-tables, will, however, have come across many examples of quite unimportant places that are occasionally favoured with stops made by trains of an express character, whilst similar trains pass the station without stopping.

When he has noticed that such stops exist, he will doubtless look for the cause. In many cases he will be able to arrive at a fairly satisfactory conclusion regarding the *raison d'être* of these unusual calls, but not always, and a few of these instances are dealt with in the following remarks.

Unusual and unexpected intermediate stops of this class may be divided into six separate classes, although some of these classes are so closely related that the stop may result from circumstances connected with two or more of the causes, one of which may not be sufficiently important, but in conjunction with another or more, turns the scale, in favour of the stop.

The divisions into which we place these unusual stops are :—

For the purpose of picking up or setting down the mails.

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To give good connections with certain branch lines.
Competition with another railway.
To develop a district for residential purposes, and so build up a season-ticket traffic.
To make up the load of a train nearly full from previous stops.
Local interests, " policy," &c.

The above reasons refer particularly to places that otherwise would not have the benefit of express trains. There is a further class—that of fairly important towns—entitled to a good train service, to provide which would require additional train mileage if advantage were not taken of passing expresses, which, therefore, are booked to call at stations in this category. Many uncommon Sunday stops can thus be accounted for.

In the following examples of these train stops, without professing to be " behind the scenes," we offer reasons that may generally be accepted as bearing on the point.

With regard to stops principally for Post Office purposes, it will be found that these occur usually with trains running late at night or in the early hours of the morning, and also in some cases on Sundays, when the ordinary train service is not convenient for postal purposes.

Stops of this character are not so frequent as they were years ago. The re-arrangement of mail trains, the introduction of road motors for mail purposes, and the utilisation of goods trains, which now run with comparative punctuality, have eliminated many of these calls at wayside stations when most people are in bed.

One of the most notorious of these stops was that at Staplehurst (population 1,800) by the up Ostend mail, due to leave Dover at 1.55 a.m. This train brought the mails from all parts of Kent. Those from Margate, Ramsgate, Sandwich and Deal, went by road to Dover, At Staplehurst horse mail-carts, from central and southern Kent, transferred the mails to the train. Now a late train runs from Margate to Ashford, and the mails go the whole way by train, which carries third-class passengers as well. It now leaves Dover at 10.40 p.m., calls at several stations, including Staplehurst, runs *via* Redhill, and reaches Cannon Street at 1.20 a.m. Although passengers are carried to and from other stations, the Staplehurst stop is merely for postal purposes, no passengers alighting or joining the train there. Amongst early morning calls is that at Selby (1.48/1.55 a.m.) by the 7.40 p.m. East Coast train from Edinburgh. After leaving Selby, this train omits Doncaster, and runs to Retford, a distance of 35¾ miles.

The 7.20 p.m. Sunday train from Hereford to Bristoi calls at Abergavenny (24 miles) at 8.2, but other expresses on this section run non-stop between Hereford and Pontypool Road. In the reverse direction, the 5.40 p.m. Bristol and Hereford express calls at Abergavenny at 7.0 p.m. These stops give connections with the road motor conveying mails from Brecon at 4.45 p.m., reaching Abergavenny at 6.45 p.m.

Many stops at minor junction stations are made on Sundays, and may, therefore, be concerned more or less with postal business. For this reason we commence with a list of unusual junction calls by expresses occurring on Sunday.

The Great Western Railway has on Sundays a non-stop run from Paddington to Princes Risborough by the 11.10 a.m. Chester express, in 42 min. for the 34¾ miles. Princes Risborough is a junction for three branches—Oxford, Aylesbury and Watlington, but to or from none of these places is there a connecting train. The up Birkenhead express also calls at Princes Risborough on Sundays at 8.18 p.m. (arrive Paddington 9.0 p.m.). In this case there is a train due from Aylesbury at 7.57.

On Sundays the 1.0 p.m. from Plymouth calls at Chippenham (6.13/6.18) and then runs 94 miles non-stop to Paddington, arriving 8.10. Chippenham is the junction for Calne, as well as for the old route to Weymouth through Trowbridge. This Sunday stop gives a London connection from Calne, but not from the Trowbridge line. There is a non-stop run on weekdays between Paddington and Chippenham, by the 4.15 p.m. Plymouth express, which arrives at Chippenham at 5.55 and connects with the 6.15 p.m. railmotor to Trowbridge, and 6.10 to the Calne branch.

The late London and North Western Railway affords special stops at junctions

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on Sundays, of which the main line expresses, which on that day run *via* Northampton, afford examples. The 8.30 a.m. from Birmingham, which calls at Northampton (10.24/10.30) stops at Roade at 10.43, and then runs non-stop to Willesden, but occupies 71 min. for the 54¼ miles. This stop gives a connection from Northampton to stations between Roade and London, by changing into the 10.10 a.m. slow train from Rugby, which runs *via* the main line. Similar facilities are provided in the afternoon by the 10.45 a.m. *ex* Manchester, calling at Roade at 3.19, and running thence to Willesden in 65 min.

The South Eastern and Chatham section of the Southern Railway affords an example of a Sunday stop at a suburban junction, the 10.10 a.m. from Charing Cross, calling at Hither Green at 10.32/10.34, and then running non-stop to Ashford, 49 miles in 62 min. The Hither Green stop, however, is probably more for the benefit of the residents of this popular suburb, desirous of spending Sunday at the coast, than for the convenience of passengers off the Loop line.

Some years ago practically every train to St. Pancras stopped at Kentish Town, but now such calls are not made. The 8.8 a.m. from Derby on Sundays, after calling at Bedford at 10.40, runs non-stop to Kentish Town, arriving 11.48. The Midland Railway has also a stop on Sundays at Stockport at 5.22 a.m. by the Saturday midnight train from St. Pancras (Derby 3.55 a.m.). On week-days this train calls at Matlock at 4.23 a.m. In the up direction, the Matlock stop is not made either on Sundays or week-days.

Stops at unimportant junctions to provide good connections on (often relatively unimportant) branches, frequently result from considerations of policy, for competitive purposes, and at times from influence of some local magnate, whose goodwill it is desired to retain, or by conditions imposed by local bodies or landowners when the line was made; whilst others of these stops it is difficult to explain. The stop at Headcorn of the 4.31 p.m. from Charing Cross is of this character. At first blush it might be thought the stop was to give a good service from London to the Kent and East Sussex line, but as the train is due at Headcorn at 5.33 p.m. and the local train does not leave till 6.54 p.m. (except on Saturdays), this obviously is not the

Photo.] **LONDON & NORTH EASTERN RAILWAY.** [*A. B. MacLeod.*

Marylebone–Sheffield express near Aylesbury.
Great Central 4-6-0 locomotive, "City of Liverpool."

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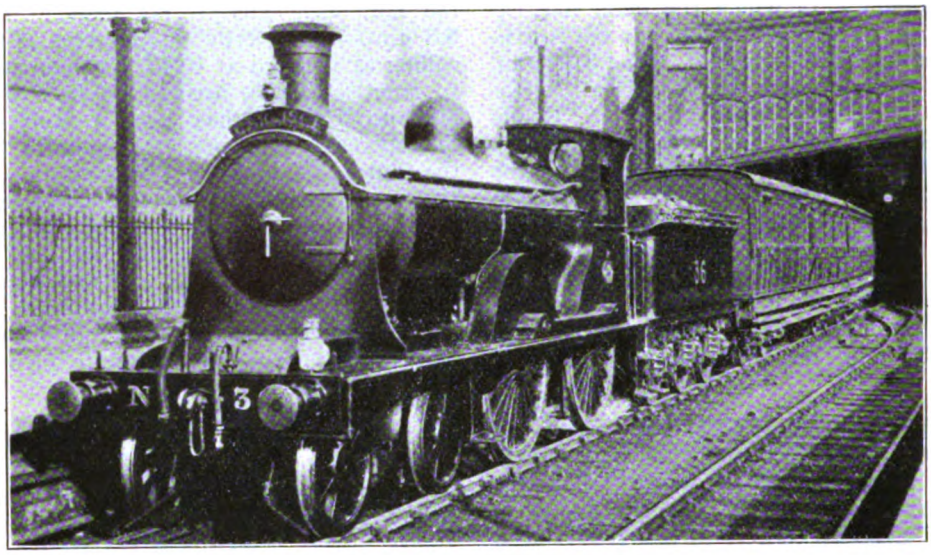

Photo.] LONDON & NORTH EASTERN RAILWAY. [*A. B. MacLeod.*

Silloth train in Carlisle (Citadel) Station.
North British Rebuilt 4-4-0 engine No. 36.

reason. The London connection for the 6.54 p.m. Kent and East Sussex train, is the 5.12 p.m. Cannon Street. A Kent and East Sussex train arrives at 5.30 p.m., and if there be any passengers for stations down the South Eastern and Chatham Railway they might catch the 5.33 train; but the advertised connection is with the 6.36 p.m. *ex* Headcorn, and the up connection at 6.51 p.m. The 43½ miles from London Bridge to Headcorn are covered in 55 min.

Tabulating stops that fall quite naturally under the second heading, the 9.15 a.m. from Euston runs non-stop from Willesden Junction to Blisworth, 57½ miles in 63 min., the next stop being Coventry. The Blisworth call gives a connection to Northampton, but the only connection at Blisworth with the Stratford-upon-Avon and Midland Junction line is from a train arriving at 9.40—a wait of 51 min. By changing at Blisworth into a stopping train, leaving at 10.45 a.m., good connections are given to Weedon, Welton and Rugby. The 9.30 p.m. *ex* Euston, is non-stop to Blisworth, 63 miles in 73 min., but the arrival there is too late for any connections either up or down, with the Stratford-upon-Avon and Midland Junction line. But it gives a good connection to Northampton, and a useful one thence in the down direction. In the up direction the 3.25 p.m. from Crewe calls at Blisworth (95 miles in 112 min.) and gives excellent connections, up and down, with Northampton. The non-stop run of 63 miles to Euston is made in 69 min.

The late London and South Western Railway has several stops by expresses obviously for branch connections, such as the 5.21 p.m. down *ex* Templecombe, which calls at Axminster (Lyme Regis connection), as does the 12.10 p.m. from Exeter, although the stops of the 7.30 a.m. from Exeter at Axminster and Gillingham, cannot be allocated under this head. The call of the 1.0 p.m. from Waterloo at Andover Junction, gives an excellent connection there with the Midland and South Western Junction Railway's 2.40 p.m. thence to Cheltenham. So does the 6.0 p.m. from Waterloo, with the local company's 7.50 to Swindon. This main line train makes its first stop at Farnborough (33¼ miles from Waterloo) at 6.44, two stops thus being interpolated in the Waterloo-Salisbury run. This first stop at Farnborough brings this train into the category of those that make stops for developing a residential district. Two

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up non-stop runs are given in the morning from Farnborough to Waterloo at 9.15 and 10.13, both in 43 min.

The 3.20 p.m. express from Victoria to the Kent Coast makes its first stop at Sittingbourne (44¾ miles in 62 min.), a branch train from Sheerness makes a close connection, and there is also a connection to Sheerness. The up non-stop train from Sittingbourne to Victoria leaves at 10.51 a.m., and occupies 67 min. on the journey, running the whole way just in front of the "Granville" express. The branch connection arrives at Sittingbourne at 10.43.

The 10 a.m. *ex* Liverpool Street calls at Mark's Tey at 11.9, the Cambridge train leaving at 11.22. Express trains usually call at Chelmsford and Colchester, if at all, between London and Ipswich. The best trains usually run through to Ipswich (or beyond), but the 12.33 p.m. from Liverpool Street calls at Manningtree (59½ miles in 87 min.); there is a wait of half-an-hour for both up and down branch connections.

Certain Midland Division (London Midland and Scottish Railway) expresses in the Derby-Manchester non-stop series, make a stop at Cheadle Heath to detach a Liverpool portion, *e.g.*, 3.0 and 9.2 p.m. *ex* Derby, which occupy 72 and 70 min., respectively, for the journey of 53½ miles. Although not shown in the time-tables, a similar stop is made in the up direction by the 12.20 p.m. from Manchester Central. The joint ownership of various lines in this district results in other unusual stoppages by through expresses, made chiefly for benefiting the Liverpool service. Chinley is the first stop of the 1.30 p.m. from Sheffield—25¼ miles in 42 min.—but only 37 min. in the opposite direction by the 12.13 p.m. from Chinley. In addition to connections with the Liverpool line, Chinley is the junction for Buxton. The 8.15 a.m. Sheffield to Manchester, makes a stop at Hope (14¾ miles in 28 min.). The population of Hope is 579, but the time-table states it is the station for two villages—Castleton and Bradwell, both two miles distant.

(*To be continued.*)

A NEW ZEALAND SUBURBAN TRAIN.

Photo.] [*W. W. Stewart.*

AUCKLAND-PAPATOETOE TRAIN, NEW ZEALAND GOVERNMENT RAILWAYS, LEAVING GREENLANE.

4-6-4 tank engine No. 686.

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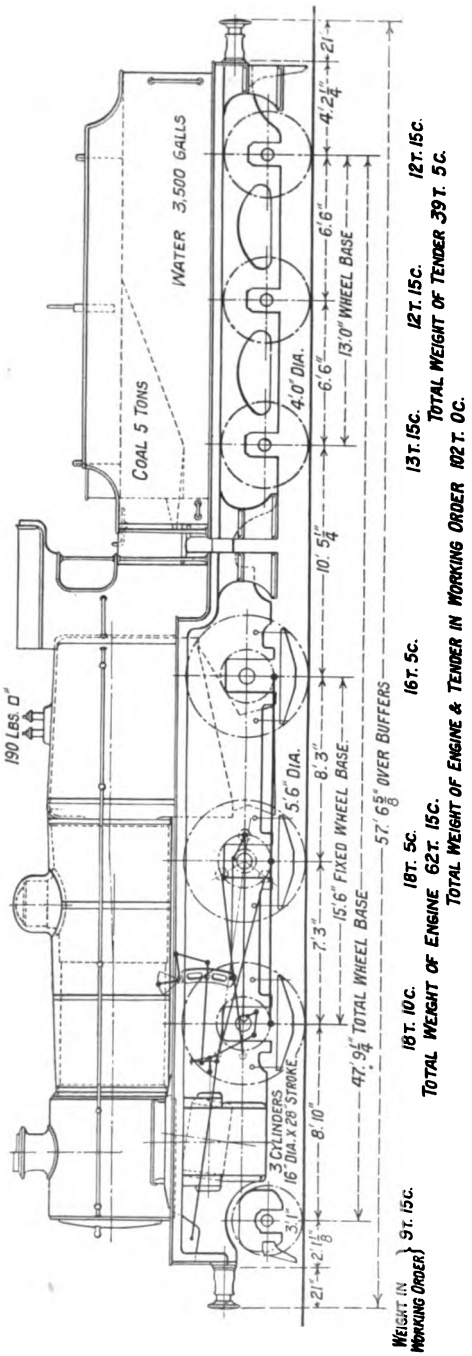
Three-Cylinder 2-6-0 Locomotive for the Southern Railway.

(SOUTH EASTERN AND CHATHAM SECTION).



OF an order for fifteen 2-6-0 locomotives, Nos. 811 to 825, now being built at Ashford Works to the designs of Mr. R. E. L. Maunsell, M.I.M.E., the Chief Mechanical Engineer, engine No. 822, illustrated as frontispiece to this issue, has been turned out as a three-cylinder simple superheater engine. The three cylinders measure 16 in. diam. by 28-in. stroke and are arranged two outside and one between the frames, all driving the middle axle of the coupled wheels. The outside cylinders are placed horizontally, while the inside cylinder is inclined at 1 in 8 relatively thereto, in order to allow the connecting rod and cross-head to clear the leading coupled axle. The 8-in. diam. piston valves are identical in each cylinder, the outside valves being set above, and the inside valves on the side of the cylinder barrels. The outside piston valves are actuated direct by Walschaert valve gear, the motion from which is carried forward so as to actuate a large $2\frac{1}{8}$ to 1 cross lever with its $1\frac{1}{8}$ to 1 floating lever arranged horizontally across the front of the engine, thus giving the motion to the inside cylinder piston valve. This device for actuating the third cylinder has already been used on the Continent, and also by Mr. H. N. Gresley in his three-cylinder engines, but in the locomotive now described the motion is taken from each outside pendulum lever to the cross levers, instead of from an extension of the front end of the valve spindles. In this way the valves of the outside cylinder are kept horizontal and any variation due to expansion of the valve spindle or the wear of the link and pins is not transferred to the valve of the middle cylinder and, in addition, facility is provided for withdrawing all the piston valves and also the middle piston without dismantling any of the gear. The left-hand outside and middle cylinders have been combined in one casting, and the right-hand cylinder is bolted to these, so as to form the complete unit. Automatic by-

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pass and water relief valves are fitted to each cylinder.

The single-throw crank axle is of the built-up type with the webs extended so as to form counter weights which balance the crank pin and part of the connecting rod. It has thus been possible to retain the same wheel centre castings as the existing two-cylinder engine by reducing the original balance weights in such a way as to give the correct angle for the resultant balance. Owing to the incline of the inside cylinder, the middle crank pin has been set at 113 deg. to the right-hand crank pin and 127 deg. to the left-hand crank pin. All three connecting rods are of the same length, the outside big end being of the plain bushed type, while the inside is of the strap bolt pattern. The reversing shaft is locked by a clutch actuated by a small steam piston working in a cylinder, to which steam is admitted when the engine is running. The cross-heads are of the single-bar type, and the motion pins work in bronze bushes with bronze side thrust washers.

It will be seen that the engine has, as far as possible, been made identical with the two-cylinder engines of the same class at present working on the South Eastern and Chatham Section of the Southern Railway, with the object of comparing three-cylinder and two-cylinder simple engines both as regards performance and cost of maintenance. The smoke-box, boiler, frames, wheels, coupling rods, cab, brake, reversing gear, are all practically identical and interchangeable with those of the two-cylinder engines of the same class. Cylinder lubrication is effected by means of a three-point sight-feed lubricator of Mr. Maunsell's design, having a separate condenser, and feeding into the three main steam pipes. The cylinder and steam chest drain cocks are of the mush-room valve type operated by means of small steam pistons, all controlled by one valve conveniently placed just below the hand reversing wheel in the cab. This same valve also controls the clutch previously referred to. Water sanding of the "Lambert" type is used for the leading and driving wheels in for-ward running. For running backwards dry sand from the tender footplate boxes is used.

The superheater, with its header of the Maunsell type, having a combined regu-lator in the smokebox with spark deflecting or diaphragm plates, is precisely the same as for the two-cylinder engines. The table of comparative dimensions given below shows the differences between the engines of the two classes. It will be noted that in order to make the tractive effort the same in each case the boiler pressure of the three-cylinder engine has been reduced to 190 lb. per sq. in.

	2-Cylinder.	3-Cylinder.
Cylinders—		
Diameter	19 in.	16 in.
Piston stroke	28 in.	28 in.
Piston valves—		
Inside admission	2 valves 10 in. diam.	3 valves 8 in. diam.
Maximum travel	$6\frac{7}{16}$ in.	$5\frac{3}{4}$ in.
Wheels		
Front bogie (Bissel)	3 ft. 1 in. diam.	3 ft. 1 in. diam.
Coupled	5 ft. 6 in. diam.	5 ft. 6 in. diam.
Heating surface—		
Firebox	135 sq. ft.	135 sq. ft.
Tubes	1,390·6 sq. ft.	1,390·6 sq. ft.
Total	1,525·6 sq. ft.	1,525·6 sq. ft.
Superheater (21 elements)	285 sq. ft.	285 sq. ft.
Grate area	25 sq. ft.	25 sq. ft.
Working pressure	200 lb. sq. in.	190 lb. sq. in.
Total weight—		
Of engine in working order	59 tons, 8 cwt.	62 tons, 15 cwt.
On coupled wheels	50 tons, 18 cwt.	53 tons

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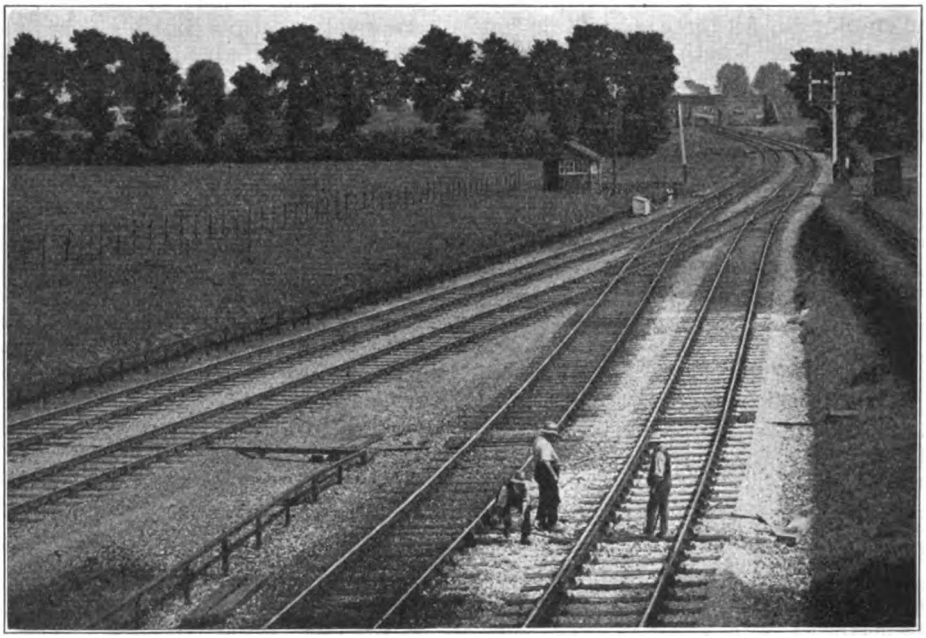
Long Distance Operation of Facing Points.

THE junction where the late Great Central Railway main line leaves the Metropolitan and Great Central Joint line 600 yards or so north of Quainton Road station, and where the Leicester main line of the Great Central section and the Verney Junction line of the Metropolitan Railway diverge, about 6¼ miles north of Aylesbury was, until recently, worked from an independent signal-box which used to stand on the down side of the line near the junction signals. The signal-box at Quainton Road is at the south end of the down platform, and it is thence, 721 yards distant, that the facing points of the junction in question are now worked, also signals 12, 13, 14, 15, 43 and 44 on the accompanying signal diagram. The trailing points are left free and lie normally, spring-worked, for the branch line. The facing points, also the six signals named, are worked electrically.



GENERAL VIEW OF JUNCTION LOOKING SOUTH.

Track circuit control has entered very prominently into the scheme, and the various circuits are shown on the diagram. These are self-explanatory, but it may be desirable to emphasise these points:—(1) That the up junction signals are so controlled that if a train on the opposite track has overrun its home signal neither signal can be lowered; (2) that after a down train has passed the starting signal 45 the facing points cannot be changed: (3) that after a train has passed signal 15 the facing points cannot be changed from normal to reversed until the whole of the train has passed the signal-box. From telephone-boxes fixed near signals 13, 15, 43 and 44 communication can be made with the signal-box. A loud-sounding annunciator on the telephone will call men to it, *e.g.*, the fireman when his engine is standing foul and holding the other line.

Power for operating the facing points is obtained from a 24-volt accumulator battery of 40 ampere-hours capacity and, for operating the signals, from an 8-volt accumulator battery of 40 ampere-hours capacity. These batteries are in duplicate so that one set may be sent away for

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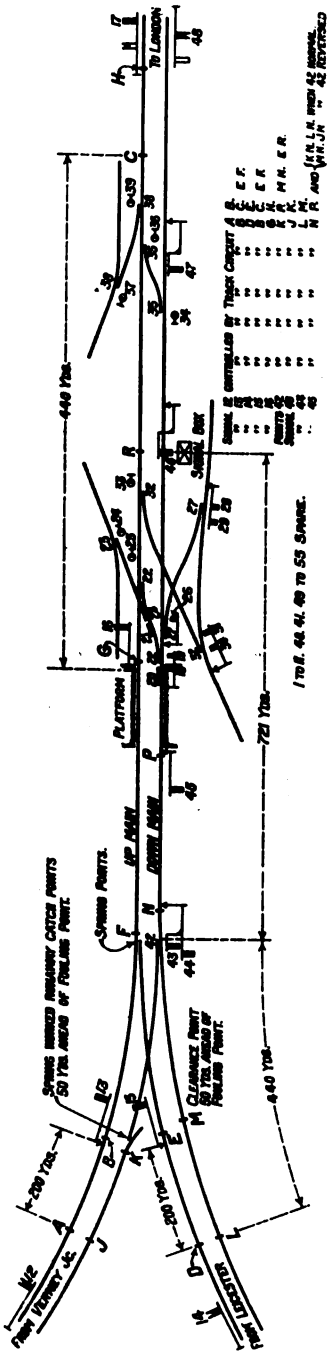

DIAGRAM SHOWING APPROXIMATE POSITION OF LINES, SIGNALS AND TRACK CIRCUITS AT QUAINTON ROAD.

re-charging, which is done every two months. For lever locks, indicators, track circuit control relays, &c., 12-volt accumulator batteries of 60 ampere-hours capacity are used. The accumulators, relays, &c., are situate in a special hut on the up side of the line.

The mechanism of the facing points is the General Railway Signal Company's low voltage switch and lock movement which, along with other of that company's specialities, was supplied by the British Power Railway Signal Company, Limited, 3A, Dean's Yard, S.W.1. The initial movement actuates the rocker shaft and withdraws the plunger, the switches are then moved to their new position, and the final movement shoots the plunger again. The points are detected in each position, and the plunger, when "home," by signals 43, 44 and 45.

The facing points lie normally for the main line and the lever in the locking frame is held by a track circuit extending from K to P and from M to N, so that once a train has passed signal 45 the road cannot be changed until the train has passed over the junction. When normal it is, moreover, controlled by a track circuit extending from E at the up main home signal to R opposite the signal-box. This prevents the points, after an up main line train has passed 15 signal, being set for the branch until the whole of the train has passed the signal-box. The indicator, lettered "42 points," shows when the points are locked by track circuit. There is, therefore, no necessity for a facing point locking bar, and none is provided.

A circuit closer on No. 42 lever, provided the track circuits concerned are clear, causes the control relay in the battery house to be energised and current to be switched on to the points. About 20 volts is required for operation, and the time taken is 18 sec. A three-way indicator is provided above No. 42 lever in the signal-box to show the movement of the points. When fully normal the indicator points to "main"; when fully reversed to "branch," and when being moved or if out of order to "wrong."

Provision has, of course, to be made for emergency working, such as the points becoming track-locked, either through a track failure or a possible change in the

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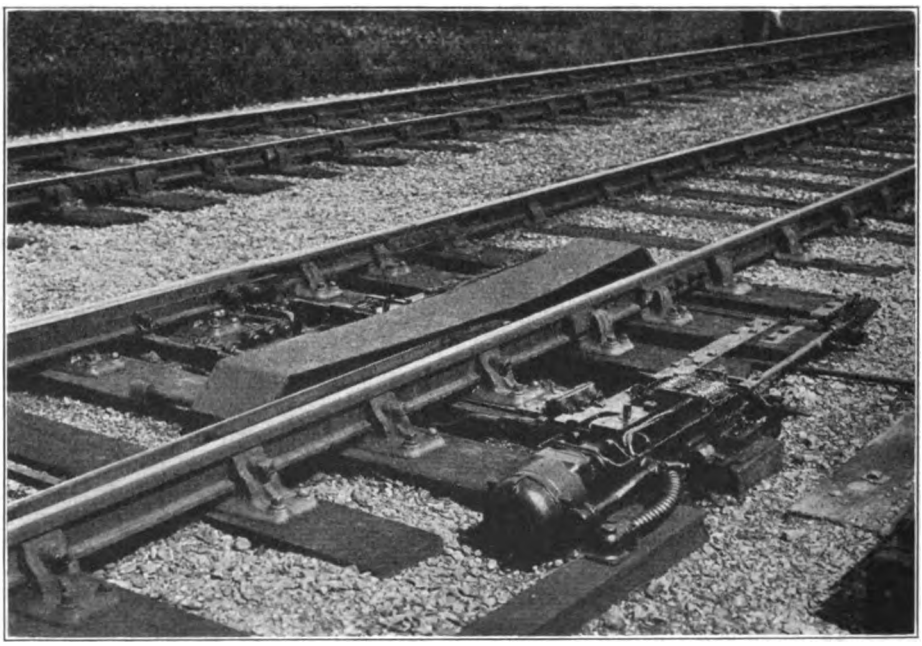
order of trains, necessitating 42 points having to be altered after they have become track-locked by the presence of a train on the track. This is done by a special switch. This is of the barrel type, and can only be moved in a clockwise direction. There are three positions on the switch, the wiring for the normal working being taken through position 1. Should the switch be moved off this position it cannot be restored until the lineman arrives and releases the same—the lineman making a note to that effect in the train register book. In using the emergency release the signalman operates the switch to position 2. This releases the lock and permits the lever being pulled to operate the points. To obtain a signal for the route set up the switch is now moved to the third position and the signal lever can then be operated. The wiring is so arranged that the signal lever cannot be returned to normal until such time as the train has cleared tracks J-K and L-M ahead of the junction. After clearing, the signal lever can be put to normal and the signalman, by alternate use of Nos. 2 and 3 positions of his switch, can carry on with his work until the lineman arrives and removes the fault, whereupon normal working is resumed.

It frequently happens in junction working that a relatively unimportant train is held at the junction home signal whilst a more important train is accepted and allowed to pass on the converging route. Where the signal-box is close to the junction the signalman can assure himself by actual observation that the first train is at a stand, but in a case like this other means have to be employed. As already pointed out there is a track circuit extending for 200 yards outside each of the junction home signals, and although the indicator may be showing "occupied" it does not necessarily follow that the up train is at a stand as required by the regulation. This is ensured at Quainton Road by a "fireman's call" plunger being provided immediately to the rear of these signals in the telephone-box. Drivers are instructed that on being stopped at these signals the fireman must immediately notify arrival to the signal-box on the bell provided for the purpose, and until this notification is received by the signalman that man is not allowed to accept a train from the converging



LAY-OUT OF FACING POINT MECHANISM.

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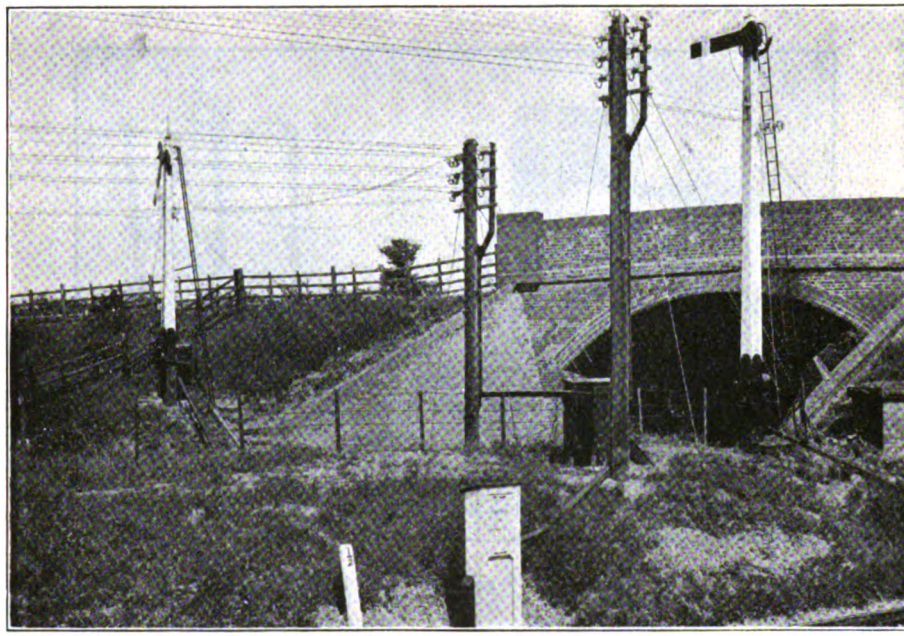
direction. This effectually prevents any risk of two trains fouling the junction at the same time.

The signals are actuated by the General Railway Signal Company's low voltage mechanism fixed at the bottom of the post. Circuit closers on the respective levers cause current to pass through the track circuit relays concerned to the control relays, which in turn allow the operating current at 8 volts to go to the mechanism. A signal is lowered in 5 secs., and the holding-off current is 0.008 amperes.

junction are V.I.R. lead covered Nos. 12 and 14 gauge, and run in casing fixed on stakes. The cable between the signal-box and the junction is buried. It terminates at each end in test boxes and contains the necessary control wires. Separate return wires are provided which terminate in sealed test boxes. The track relays are the General Railway Signal Company's 4 ohm direct current, with S.P. graphite contacts and the line relays are the same company's 960 ohm with S.P. graphite contacts. The interlocked detector and point control relays



UP JUNCTION HOME SIGNALS.

Should circumstances arise which necessitate the actuation of the facing points by hand a crank handle is taken out of a case in the battery room, the withdrawal of which from the case breaks down the circuits to 15, 43, 44 and 45 signals so that they cannot be operated and train movements must be controlled by hand signalling. The crank is then placed on the pin seen projecting upwards from the point mechanism and the points actuated thereby.

All track circuits are double insulated and bonded. The operating wires at the

are the British Power Signal Company's pattern wound to 20 and 1,000 ohm resistance. The lever locks are the railway company's own pattern with 100 ohm resistance, and the track indicators are the Automatic Telephone Manufacturing Company's with 3,000 ohm resistance.

For information and facilities for inspecting this work we are indebted to Mr. W. Clow, now Superintendent, Southern Area, London & North Eastern Railway, Mr. Harry Blundell, then Chief Engineer, Great Central Railway, and Mr. A. F. Bound, Signal Superintendent.

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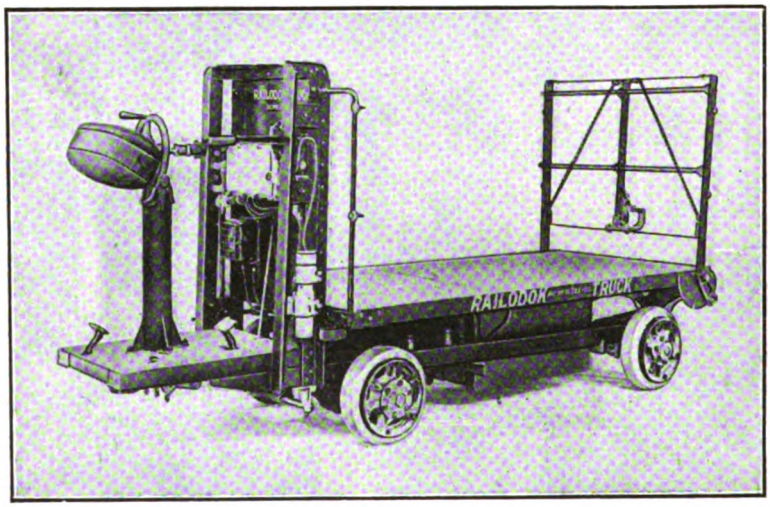
Electrical Trucks for Railway Platform Work.

HIGH wages bills and labour-saving devices go hand-in-hand. When and where labour is plentiful and cheap, invention lags, but where labour becomes either costly or scarce the mechanical genius finds his opportunity and as a rule he is far from slow in taking advantage of changed circumstances. The old method of hand trucks at railway stations and docks is a case in point. The Great War, with its consequent shortage of man power in the homeland and the subsequent raising of wages, brought to the fore the lack of economy in many long established practices at our railway stations and docks. Countries outside Great Britain, and more particularly, the United States of America, have for a long period of years realised the necessity of a better means of handling passenger luggage and goods packages, and prominent among twentieth century labour-saving devices are industrial freight trucks.

These machines are quite self-contained, driven by electric motors supplied with energy from batteries of electrical accumulators carried in a frame, controlled from a platform, or seat, and usually driven in either forward or reverse direction.

The trucks are constructed in loading capacities from 10 cwt. to 2 tons, and are in a variety of forms to meet varying conditions of service. The speeds vary slightly with the amount of load, but are generally seven to eight m.p.h., and as the turning radius is very small, varying from 7 ft. to 10 ft. according to type, goods or luggage of any description may be moved at great speed and with minimum handling in even the most awkward situations, as RAILWAY MAGAZINE readers may see for themselves at stations, such as Marylebone, the Great Central London terminus, where "Railodok" trucks are in use. These trucks, manufactured by G. D. Peters & Co., Limited at Windsor Works, Slough, have been specially designed to meet platform and dock requirements of railways both at home and abroad. The sole selling rights are in the hands of Messrs. Walker Vehicles, Limited, of Caxton House, Westminster, S.W.1.



ONE-TON "RAILODOK" TRUCK.

An investigation of the constructional work of the trucks discloses that ample

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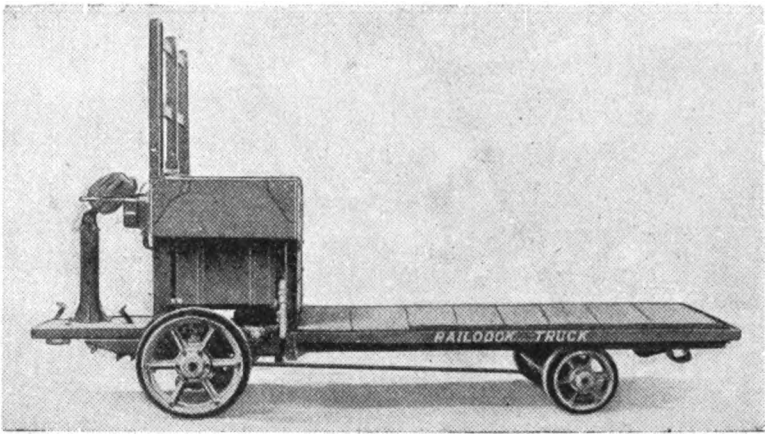
use is made of high grade chrome, vanadium, nickel and carbon steels. Interchangeable members are made to gauge and template, and all the working parts are readily accessible for repair or renewal. What appeals strongly to the practical railwayman is the assembly of sections of working parts in complete units; thus a motor may be removed and replaced without disturbance of other parts. A traction axle may be removed or a wheel taken away and a spare wheel fixed, or in event of tyre trouble, a spare rim and tyre may be fixed in a few minutes, all wheels is released, breaking the electrical circuit. The saddle is on springs and even on rough roads the driver does not find the work particularly arduous. This idea has an additional advantage as it enables the truck to be operated by a one-legged man.

For the operation of the truck, power is derived from storage batteries carried in steel containers, and they are provided with carrier springs and damping springs, so that all shocks transmitted to the battery container are absorbed both on action and re-action. The batteries in



TWO-TON DROP FRAME "RAILODOK" TRUCK.

being fitted with detachable rims. In the assembly of these trucks there are no make-up castings, which in the past in this class of work have caused considerable trouble to truck users.

As to the truck at work, it will be observed by the illustrations, that a saddle seat is provided for the driver. This seat, which is capable of being thrown over for forward or reverse driving, is connected through levers with the brake and with the controller, so that when the driver seats himself firmly the brakeshoes are released and the cut-off in the controller is brought into the operating position. When the driver leaves the seat the brake is automatically applied and the cut-off use have a capacity round about 200 ampere hours and in cases where a full charge suffices for a day's work, or as one may say, where the day's work does not exceed a run of about 20 miles, the actual cost of electrical energy does not exceed 1d. per unit.

When one considers the great economy of time and of labour by the use of station platform trucks of this type it is easy to realise that the period is approaching when they will be in common use at all important railway stations. One by one the methods of bygone spacious Victorian days disappear from railway practice, "the old order changeth and giveth place to the new."

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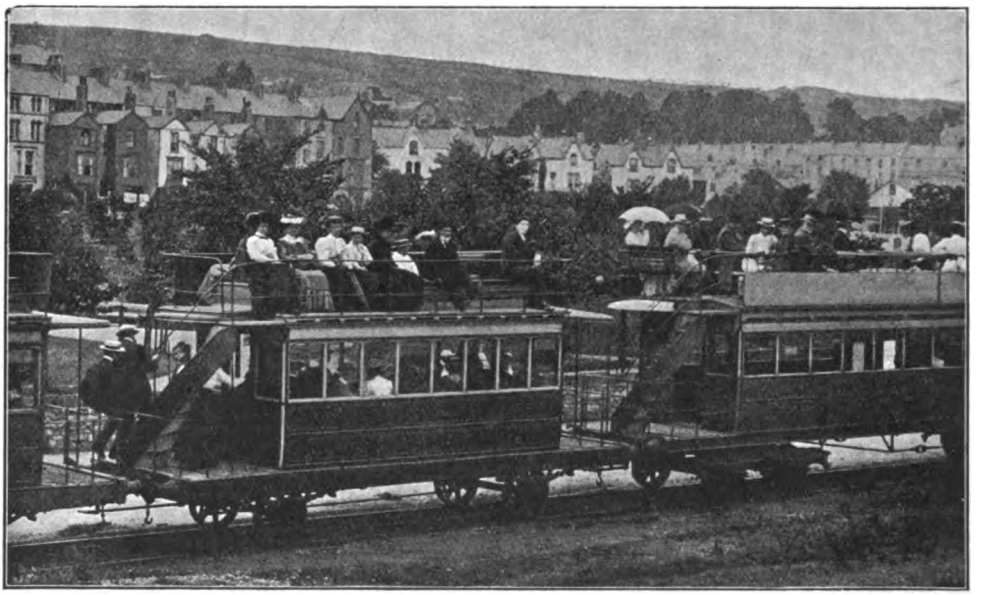
The Swansea and Mumbles Railway.

By J. JENNINGS.

CONSTRUCTED originally as a tram-road for the conveyance of iron-ore from the Mumbles iron mine to Swansea, under an Act of Parliament passed in the year 1804 this unique little concern is now purely—by day at any rate—a passenger line. The existing line is about 5½ miles in length, connecting the industrial centre of Swansea with the semi-rural seaside village of Mumbles. The line is single, with one crossing place. There are no signalling arrangements, the driver of an up train passing the key of the points to the driver of a down train as they pass.

The rolling-stock is unique in itself, and earns for the line the name of "steam tramway." The second-class cars are four-wheeled, with end-platforms, American fashion, seats running lengthways with the car, and one stair-case leading to the roof, on which are a pair of longitudinal seats arranged back-to-back. The first-class stock consists of bogie cars, with similar seats to the seconds inside, but with garden-seats on the top-deck, tram-fashion. As the station-platforms are always on the same side of the train, exits are provided on one side only. In the summer, special open cars are provided.

The engines—four in number—are suited to the needs of the service and well-worked, for as many as 20 loaded cars have sometimes to be dealt with on one train. Nos. 1 and 2, old 0-4-0 engines, have been scrapped; but Nos. 3, 4, and 5 are still in service, together with a 0-6-0 Avondale saddle-tank, *Swansea*. No. 3 is a 0-4-0 saddle-tank built by the Brush Electrical Company. Nos. 4 and 5 are 0-6-0 side-tanks, built by the Hunslet Engine Company. All these are outside cylinder engines. A few years ago an engine called the *Crumlyn*—0-6-0 outside cylinder—used to work regularly on this line, but was exchanged for *Swansea*. The *Crumlyn* was shunting at Cardiff Great Western station when I saw her last.



TRAVEL ON THE MUMBLES RAILWAY.

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There are no continuous brakes on the cars, but most are fitted with hand-brakes. The conductors walk along the footboards at the sides of the cars to issue and collect tickets. There are usually five conductors to a train. Considerable numbers of passengers are carried between Swansea and the Mumbles Terminus at which are situate Refreshment Rooms and a pleasure Pier under the control of the Railway Company. The platforms are of the low Continental type.

0-6-0 LOCOMOTIVE No. 4.

Between Swansea (Rutland St.) and Mumbles (Pier), there are six intermediate stations—St. Helen's, Brynmill, Blackpill, Westcross, Oystermouth (Mumbles central station) and Southend siding. There are coal sidings at Oystermouth, and wagon-repairing works at Blackpill. The London Midland and Scottish Railway has a station at Blackpill (Mumbles Road). A large amount of mineral traffic is dealt with at night-time.

High speeds are, of course, impossible, the only bit of "travelling" being on a down-grade between Blackpill and West-Cross, where an approximate speed of 20 m.p.h. is often reached.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE NINETEENTH CENTURY.

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Under this heading Mr. E. L. Ahrons will deal with the Locomotives and Trains of the

BARRY RAILWAY

in the forthcoming RAILWAY MAGAZINE, May, 1923.

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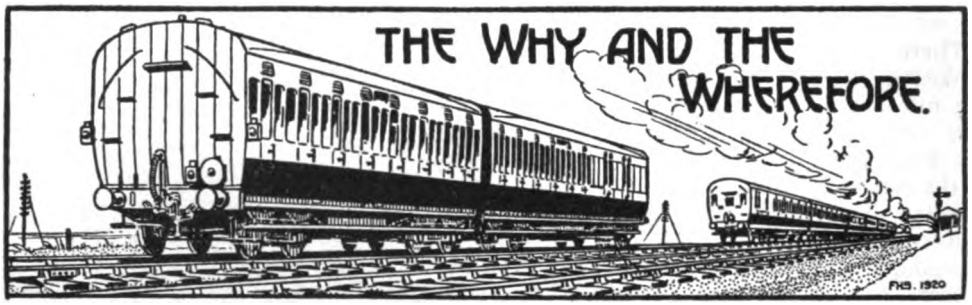

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book," should be consulted. The twenty-fifth Annual Edition of this standard railway reference work is on sale at 5s. net, or by post from the RAILWAY MAGAZINE Offices, 33, Tothill Street, Westminster, London, S.W.1, to any part of the world, 5s. 9d. The twenty-sixth Annual Edition (1923) is in preparation and it will be published shortly.

Turkey Mill Viaduct between Maidstone East and Bearsted.

We are informed by Mr. G. Ellson, Resident Engineer, South Eastern and Chatham Section, Southern Railway, that the structure referred to by you is the Turkey Mill Viaduct between Maidstone East and Bearsted stations, which skirts the ground of the Turkey Paper Mill. This mill specialises in the manufacture of some of the more expensive descriptions of drawing paper, and to prevent the paper being soiled by smoke or dirt from passing engines, the railway at the spot is enclosed by a solid brick wall on the up side of the line and covered by a light iron and slated roof. On the down side of the line, which is the one farthest removed from the mill, the side wall is perforated with openings for ventilation purposes, which afford passing views of the adjacent scenery.

[Reply to T. W. SNASHALL.]

Distant Signals.

There is no distinction made in this country between the lighting of distant and home signals at night, except on those railways (Great Eastern section of London and North Eastern Railway, and South Eastern and Chatham, "Brighton" and London and South Western sections of Southern Railway) which use the Coligny-Welch distant signal lamp, showing an illuminated fishtail at the side of the red or green light. On the Metropolitan and Underground Railways yellow is frequently used as the danger indication for distant signals in place of red. In all other cases drivers must rely on their absolute knowledge of the road to distinguish between distant and home signal lights at night, and this is admittedly a weak feature of British signalling.

[Reply to R. WEBSTER.]

Railway Anomalies.

In view of the fact that so many trains have to make numerous connections and fit in with other trains at each end of a journey, and probably at many intermediate points, it is obvious that they cannot, in some instances, make what appear to be desirable connections, even in those cases where they just miss connections which would seem to be of considerable importance. In cases where transfer traffic is proved to be sufficient to justify consideration, attempts are made to adjust trains accordingly, and when this is not done you may generally assume that, while connections would be useful occasionally, they have no regular value.

[Reply to "TRAVELLER."]

Crossing the Scottish Border.

Generally speaking the Royal Border Bridge over the Tweed, between Tweedmouth and Berwick, may be regarded as marking the point at which the London and North Eastern main line crosses from England into Scotland. If, however, the "Town" of Berwick-on-Tweed be regarded as English, or "neutral," the border would be crossed where

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the County of Berwick is entered, just beyond Marshall Meadows signal-box, and about half-way from Berwick up to Burnmouth. We know of no landmark, however, which would enable the traveller readily to identify the spot as he passes it.

[Reply to S. W. S.]

London and North Eastern Railway (North Eastern Section) "Atlantics."

We have answered this question frequently and do so again for the last time. There are 72 4-4-2 engines on this section, 10 of the original class "V," with two 20-in. cylinders, 10 of the modified class "V" (originally "V1") with two 19½-in. cylinders; 50 of the modern class "Z," with three 16½-in. cylinders; and two 4-cylinder compounds, class "4CC," Nos. 730 and 731. Why not ascertain these facts for yourself, as you live at York, by reading the class letters of the various types off the front buffer-beams of the engines?

[Reply to P. E. BROCKBANK.]

Great Western Railway and Torquay.

It has been reported that important improvements are to be undertaken by the Great Western Railway in connection with the Torquay line, including suggestions that an alternative route is to be constructed from Torquay to South Brent, so as to place Torquay on the West of England main line and avoid the very severe gradients of the present route between Newton Abbot and Plymouth. We understand that development works are to be undertaken in this district, but that the suggestion that an alternative main line is to be constructed is premature, if not entirely incorrect.

[Reply to J. MALLET.]

Exceptional Brake Applications.

The possibility that a flock of starlings colliding with a locomotive engine could cause the vacuum brake to be applied, would require a very exceptional combination of circumstances. The only suggestion we can offer is that the impact caused the connecting hose at the front of the engine to become detached, or the cock-lever moved, so as to cause the brakes to go on, either of which, we would imagine, would require a shock much greater than collision with a bird could cause. Your remarks in regard to *Railway Year Book* maps are noted.

[Reply to E. B. GOWRY and R.C.D. MARRIOTT.]

Head Lights for Electric Locomotives.

If you will refer again to the frontispiece to the August, 1922, number of the RAILWAY MAGAZINE, you will note that the North Eastern 4-6-4 electric express locomotive has electric head lights in the four positions corresponding to the lamps carried by steam locomotives. By switching lights in or out, therefore, any of the ordinary codes can be shown. On the Metropolitan District Railway in London white-painted metal plates are fitted over the lamps, so that the head codes can be shown in the open by day without the lamps being illuminated.

[Reply to C. ORD.]

Recording Signal Positions.

Devices to provide a record of signal positions have been proposed, but it is not seen that they would ordinarily possess any particular value in view of the heavy expense and complication required to install them. Where "lock and block" is employed, the fact that track contacts have to be operated by the train before signals can again be operated, ensures that the complete sequence of operations is carried out. In many cases, too, interlocking constitutes a check upon signal operation.

[Reply to D. J. HIRST and G. O. WALLIS-PALMER.]

Metropolitan Rolling-Stock on Great Northern Railway.

Apparently the train you noticed at York Road station, King's Cross, consisting of a Great Northern 0-6-2 tank engine hauling a train of miscellaneous Metropolitan vehicles, was conveying stock *en route* from the makers to be handed over to the Metropolitan Railway. No doubt, in due course, engines of various grouped lines will appear at stations belonging to other "constituents" of the same grouped company, either for trial purposes or as a development in traffic working.

[Reply to CLAUDE SHARPE.]

Train Working at Terminal Stations.

It is but rarely at big terminal stations that the arriving engines work the same

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vehicles out, unless considerable intervals of time are available. Where another engine is attached, six trains per hour at one platform, especially if there is a separate engine bay avoiding interference with traffic on other lines, is a good achievement. There are, however, a few places where, with steam trains, this is occasionally exceeded. As a general proposition, however, six trains per platform per hour must be about the limit with steam traction.

[Reply to G.H.K.]

The Forth and Tay Bridges.

Full particulars of these undertakings have been given in several issues of the RAILWAY MAGAZINE, and are included in the "Railway Year Book," the new edition of which will shortly be published. The two main spans of the Forth Bridge are each of 1,700 ft., the total length, including approach viaducts, being nearly 2 miles. The Tay Bridge is slightly over 2 miles in length. Reduced speed is required in crossing these bridges, so that, taking an average of 30 m.p.h., about 5 or 6 min. would be occupied.

[Reply to R. A. ATHILL.]

Compound Locomotive Exhaust.

Exhaust of compound engines is nearly always soft, and sometimes almost inaudible, on starting (except in the case of such compounds as the Midland Deeley type, in which high pressure steam is admitted direct to the low-pressure cylinders on starting), owing to the low steam pressure obtaining in the low pressure steam-chest until the steam is exhausting sufficiently rapidly from the high-pressure cylinders to raise that pressure to the ordinary running figure.

[Reply to DESMOND F. ANDREWS.]

Plymouth and Dartmoor Railway.

This is a very early line, intended to connect Plymouth and Princetown for the purpose of conveying stone, the wagons being hauled by horses and the line being also available for private traffic on payment of tolls. The gauge is 4 ft. 6 in., but the section which has been taken over by the Southern Railway, as successor to the London and South Western Railway, has, of course, been rebuilt as an ordinary line. The other points raised by you will receive consideration.

[Reply to R. S. J.]

Gradients.

The case you cite of the Dingwall and Skye line is far from a record in the matter of gradients. The Lancashire and Yorkshire section of the London Midland and Scottish Railway boasts 2 miles of line (the Werneth incline at Oldham), traversed by passenger trains, inclined at 1 in 27. The Somerset and Dorset Joint main line has two 3-mile stretches at 1 in 50 in one direction, and from the summit a continuous fall of 7½ miles chiefly at 1 in 50-70.

[Reply to F. A. BIRKETT.]

2-6-2 Tank Engines, London Midland and Scottish Railway.

According to the latest official returns, there are still 18 of the 2-6-2 tank engines introduced for working the Manchester-Oldham route of the late Lancashire and Yorkshire Railway. We have no information as to the duties upon which they are now employed. We agree that it is somewhat strange that this very suitable type should have been superseded by the superheated 2-4-2 tank engines on this very difficult route.

[Reply to L. G. J.]

Annett's Key.

This is widely used on single line branches in order to prevent points, etc., being operated except by the train crew in possession of the staff for the section concerned, and to ensure that, after use, points are returned and locked in their normal positions. A key is combined with the staff and has to be used in order to unlock the lever frame in a signal cabin or point levers. The staff cannot be released again until the points are returned to normal.

[Reply to R. T. MINNIS.]

More Mythical Speeds.

Adriatic on the London & North Western Railway was a 3-cylinder compound of the 2-2-2-0 type, and not a "single-driver" in the ordinary acceptation of that term. In the "Race to Aberdeen" of 1895 she ran the West Coast train from Euston to Crewe at an average speed of 64·3 m.p.h., but no maximum speed in the remotest degree approaching that which you mention was attained at any point on the journey.

[Reply to J. C. L. PARSONS.]

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Midland Compounds.

There has been no alteration in the serial numbering of these engines, and we have no doubt that what you saw was one of the compound engines coupled to the tender of 4-2-2 No. 690. Exchanges of this character take place at times, owing to the development of unexpected defects in a tender, in order to avoid the necessity of laying off also the engine to which it belongs.

[Reply to " MIDLAND."]

Tapered Chimneys, Great Western Railway.

The Great Western locomotive authorities have no doubt carefully considered the question and find that the new tapered chimneys now being fitted to both new and old engines give better results as regards steaming than the previous parallel type. A similar substitution is at present taking place on a number of Great Central types on that section of the London and North Eastern Railway.

[Reply to " L. & N.E.R."]

Old Metropolitan Locomotives.

If you examine the photograph reproduced in the February RAILWAY MAGAZINE more closely, you will see that the safety valves are on the steam dome. The arched pipe over the firebox is for exhaust steam escaping from the side tanks, remaining after the bulk has been condensed. The smaller looped pipes relate to the brake system then employed.

[Reply to K. W. S. M.]

Edinburgh-Aberdeen Service, North British Railway.

For a short time in 1906, after the introduction of the " Atlantic " engines and the new corridor stock, the journey between Edinburgh and Aberdeen was scheduled in three hours in both directions, but the extreme difficulty of the route proved these times to be impracticable, and they had subsequently to be increased.

[Reply to F. A. BIRKETT.]

Maximum Speeds, London and North Eastern Railway (Great Eastern Section).

We know of only one authenticated maximum speed of over 80 m.p.h. attained on this railway (by a 4-4-0 " Claud Hamilton " engine on an up Southend express, when 81·8 m.p.h. was reached on Brentwood Bank), but there is no doubt that this is not an isolated case.

[Reply to " L. & N.E.R."]

Main Line Rolling-Stock.

We understand that the quintuple trains introduced on the Great Northern Railway by Mr. H. N. Gresley, are entirely successful, though whether further trains of the same type are built may be governed by other factors. We do not understand what train you refer to as the " Southern Railway's (old London and South Western Railway) train *de Luxe*."

[Reply to K. H. S. MASSEY.]

Midland Locomotives, London Midland and Scottish Railway.

Driving wheel diameters of express engines on this railway vary from 6 ft. 6 in. in the case of the " 999 " class 4-4-0's to 7 ft. in that of the compounds, and as much as 7 ft. 9 in. in certain of the single-driver engines. Tank engine classes comprise the 0-4-0, 0-6-0, 0-4-4, 0-6-2, 0-6-4, 4-4-2, and 4-6-4 types.

[Reply to " INTERESTED."]

Great Western Railway Locomotives.

Enquiries as to the dates when individual locomotive classes were placed in service cannot be dealt with. It is difficult to indicate the cost of constructing a locomotive to-day of the same design as one built before the war. The cost would probably be at least double the pre-war cost, if not in a higher proportion.

[Reply to K. H. D.]

Wimbledon Trains.

Metropolitan District electric trains use London & South Western lines between East Putney and Wimbledon. To allow trains of both companies to use the same tracks, the running rails are bonded to provide track return for London & South Western trains, while Metropolitan District trains use the central negative conductor rail.

[Reply to A. F. R. C.]

Superheated 0-6-2 Tanks, London and North Eastern Railway (Great Northern Section).

We are not able to offer any explanation of the orchestral effects which you have noted when these engines are at work; and we are far from agreement that their work is in any way inferior to that of the previous non-superheated 0-6-2's; our experience is the reverse.

[Reply to W. E. C.]

Worthington Feed Water Heater.

We are advised by Mr. H. N. Gresley that the appliance fitted to Great Northern

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2-cylinder 2-8-0 locomotive No. 470 is a Worthington feed water heater. This is a type which has been used somewhat extensively in the United States, and is now being subjected to trial under English working conditions.

[Reply to J. W. K.]

Test Runs, London and North Eastern Railway.

Experimental trips in connection with proposed new facilities or alternative working arrangements are frequently made by railway companies for their own information. We have no special knowledge as to the runs indicated by you. Should any become available, reference thereto will be made in due course.

[Reply to "SCOTTIE."]

Midland and Great Northern Joint Railway.

New locomotives are usually built at Derby and the coaching stock supplied from Doncaster. Both of the owning companies, have however, contributed existing material, while a certain amount of reconstruction and new construction has been carried out at the Melton Constable Works.

[Reply to "CITY OF MANCHESTER."]

London, Brighton and South Coast Brake-Van at Liverpool Street.

There is a daily interchange of traffic between the Great Eastern and Brighton lines via Liverpool Street, the East London Railway and New Cross, which accounts for your seeing Brighton coaching stock at Liverpool Street. There is now no through passenger service, however.

[Reply to R. E. MOODY.]

Corridor Coaches.

The Great Western Railway first introduced corridor coaches about 1890. A corridor train was placed in service in March, 1892. The London and North Western Railway followed shortly after with a corridor train for the 2.0 p.m. Scotch express from Euston, which was for many years known as "The Corridor."

[Reply to J.F.F.D.]

Articulated Bogie Stock.

Repair of any one coach-body, bogie, wheel or axle in an articulated set of bogie vehicles necessitates the withdrawal of the whole set until the repair is complete. This is the only possible objection to outweigh the advantages of this method of construction. Your other query contravenes the rules.

[Reply to G. TENTEN.]

0-6-0 Engines, Somerset and Dorset Joint Railway.

New large superheated 0-6-0 engines on the Somerset and Dorset Joint Railway were built at the Derby works of the Midland Railway for the former company. Speeds up to 70 m.p.h. are reached on favourable grades by the express engines of the Somerset and Dorset Joint Railway.

[Reply to Z. C. ELWES.]

British "Pacific" Locomotives.

Dimensions of the three British "Pacific" type engines have been given in previous issues, and compared, and you must draw your own conclusions as to which is the "largest," whatever may be the precise meaning of that somewhat vague term.

[Reply to E. S. MURRELL.]

New 4-4-0 Engines, London and North Eastern Railway (Great Central Section).

A series of engines of the improved "Director" 4-4-0 type, named after battles, &c., of the late war, is now in service, and one of these was illustrated on p. 198 of the March issue. It is contrary to our practice to give names and numbers in these columns.

[Reply to "MOUNTAINEER."]

Engines on Particular Trains.

It should be obvious to you that we cannot state that a particular engine is likely to be working a certain train on a given date. Your inquiry in regard to Glasgow and South Western locomotive *Lord Glenarthur* is answered by the frontispiece of the March number.

[Reply to D. J. BELL.]

Manchester, South Junction and Altrincham Railway.

This line has its own rolling-stock, but locomotive power is provided in alternate periods by the Great Central (now London & North Eastern) and London & North Western (now London Midland & Scottish) Railways.

[Reply to F. M. C. K.]

Broad Street–Southend Trains.

Obviously, the new through service is not as yet suitable for season-ticket travel.

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It gives, however, through facilities which may be useful to meet occasional requirements. Its principal interest is that it may foreshadow important developments in the future.

[Reply to " PRINTER."]

Cambridge Main Line, Great Eastern Railway.

Highest speeds on a run over this route may be anticipated in the neighbourhood of Newport and between Great Chesterford, going north, and at Stansted and anywhere from Harlow to Angel Road, coming south.

[Reply to P. D. MORRIS.]

Gradients, Dore and Chinley Line.

In Totley Tunnel the gradient from the Sheffield end is rising at 1 in 100 for about 1½ miles, then at 1 in 176 for ½-mile, and finally at 1 in 150 for the remaining 1½ miles. In Cowburn Tunnel the figure is mainly 1 in 150 falling.

[Reply to E. S. MURRELL.]

Locomotive Appliances.

Queries as to whether any particular appliance is standard on a given railway cannot be answered. It may be systematically employed, but it does not follow that it would be invariably used.

[Reply to J. C. L. PARSONS.]

Hildenborough Bank, South Eastern and Chatham Railway.

Gradient is 1 in 144 for the 2 miles through Sevenoaks Tunnel, and 1 in 122 for the next 4 miles, falling in favour of down trains.

[Reply to P. D. MORRIS.]

Drummond 4-4-0 Locomotives.

The last series of 4-4-0 locomotives, the 470 class, designed by Mr. Drummond, for the Glasgow and South Western Railway, have Stephenson link motion.

[Reply to A. MARVIN.]

4-4-2 No. 271, London and North Eastern (Great Northern) Railway.

This is the only one of its class, and is a rebuild from a 4-cylinder simple 4-4-2 engine.

[Reply to R. E. MOODY.]

Snow Hill Incline.

The steepest part of the gradient from Farringdon Street to Ludgate Hill is at 1 in 43.

[Reply to R. S. J.]

12.25 p.m. St. Pancras–Manchester.

Calls at Cheadle Heath 4.8–4.12 p.m. in order to detach the two Liverpool coaches.

[Reply to " SEEKER."]

Photo.] SOUTHERN RAILWAY. [*G. H. Cannon*

Up goods train at Woking. London & South Western 4-6-0 express goods locomotive (5 ft. 7 in. class) No. 1510.

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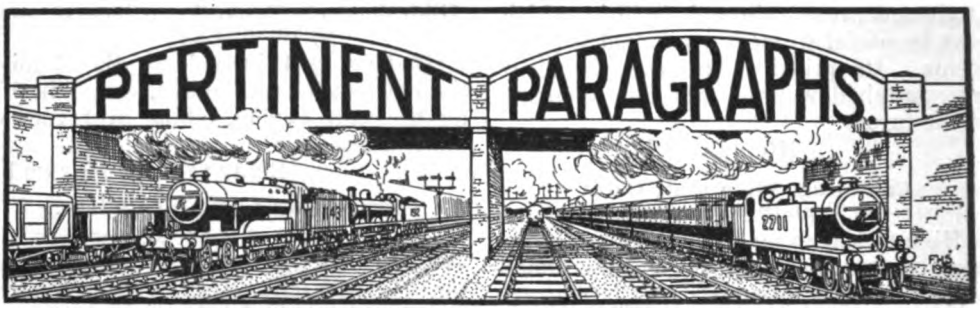

New Colour Plates of Locomotives.

IN pre-war days the lithographic colour plates of British locomotive engines published by the proprietors of the RAILWAY MAGAZINE, but sold separately therefrom, were eagerly acquired by collectors throughout the world, and they still are held in high esteem by those who are fortunate enough to possess complete sets or even odd copies of what are "out-of-print" and much sought for colour pictures.

Of late years conditions have not been favourable for the production of a new series of these popular plates, but in view of the special interest attaching to the modern locomotives of the larger companies, and the fact that the leading railways are now losing the individualities which have so long characterised them, a series of four 20 in. by 12 in. lithographic plates, printed in 11 colours, will be published on April 9, and the pictures will be on sale, price 1*s.* each, or 1*s.* 2*d.* each post free, unfolded, rolled in a tube and ready for framing. A complete set of the four plates will be forwarded post free on receipt of 4*s.* 3*d.* The engines to be illustrated are :—

(1) *Great Western Railway.* — Four-cylinder 4-6-0 locomotive No. 4061, *Glastonbury Abbey.*

(2) *London and North Eastern Railway.*— Great Northern three-cylinder 4-6-2 locomotive No. 1470, *Great Northern.*

(3) *London Midland and Scottish Railway.* —London and North Western four-cylinder 4-6-0 locomotive No. 1407, *L/Corp. J. A. Christie, V.C.*

(4) *London Midland and Scottish Railway.* —Caledonian three-cylinder 4-6-0 locomotive No. 956.

In each case the locomotive is shown painted and lined out in the style of its company prior to grouping. Bearing in mind the changes in lettering, marking, lining and probably in colours as a whole that are pending, these plates will be in great demand, and they will be treasured by the purchasers as indicating the respective practices immediately anterior to the grouping introduced recently, and the loss of so much that was distinctive in the characteristics of the various types, all of which have contributed to the intelligent and enthusiastic study of locomotive practice and performance by thousands of people, both inside and outside the railway service.

The End of Government Compensation.

UNDER the presidency of Sir Henry Babington Smith, G.B.E., the Railways Amalgamation Tribunal sat at 7, Whitehall Gardens, S.W., on Wednesday, February 21, at 11 a.m., to consider the fifth and last scheme of allocation of compensation for claims in respect of Government possession of the railways. Mr. Hugh Bischoff appeared on behalf of the Railway Companies Association, the promoters of the scheme.

Mr. Bischoff explained that the scheme represented the final distribution under the "Railways Compensation Account" provided under the Railways Act, 1921. It dealt with three sums : (*a*) £809,456 being the balance remaining out of the sum of £24,500,000 referred to in Section (1) (*a*) of the Act and held in suspense under the First and Second schemes ; (*b*) £125,000, the balance of the sum of £500,000 referred to in Section 12 (1) (d), as compensation for leased and worked companies, and (*c*) all interest accrued upon the moneys placed on deposit with the bankers. This had been calculated from January 16, 1922, to February 22, 1923, to amount to £78,287. The total amount to be distributed on this occasion was £1,012,743. The scheme had been circulated to all the companies entitled to participate, and had been agreed to by all. The Tribunal being satisfied with the evidence, announced that they approved the scheme, and that authority to the bankers to pay the money would be given forthwith under seal.

With this allocation, the "Railways Compensation Account" provided under the Railways Act, 1921, was finally closed. Some

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60 million pounds have thus been dealt with, as follows :—

	£
First scheme, dated December 21, 1921	23,610,437
Second scheme, dated May 15, 1922	80,107
Third scheme, dated July 17, 1922	10,000,000
	375,000
Fourth scheme, dated January 31, 1923	25,000,000
Fifth scheme, dated February 21, 1923	1,012,743
	£60,078,287

The Railways Act provides that the payment of this money " shall be a full discharge and in satisfaction of all claims " which the companies might otherwise make for compensation in respect of Government possession of their undertakings, and accordingly, with the distribution of the last million, an interesting and difficult chapter in railway history and one which, but for the good sense and moderation of the parties most nearly concerned, might have developed into a formidable and contentious issue, has been brought to a satisfactory close. Since the beginning of this year, the companies have received over 31 millions in compensation, which they can apply towards the cost of much-needed renewal and development work, and henceforth they stand squarely upon the provisions of the Railways Act, especially in regard to charging powers, and the economic and efficient conduct of their undertakings.

Lord Claud Hamilton.

AT the final annual meeting of the Great Eastern Railway Company, Lord Claud Hamilton made his last public appearance as a railway chairman, the meeting being held, an interesting coincidence, on his eightieth birthday. During his long association with the company, Lord Claud had come to be regarded as the personification of the great traditions of the Great Eastern Railway. When he joined the Board in 1872 he had no experience of railway work. But on that Board he succeeded one of the greatest men of the last century, the late Lord Salisbury, and to be asked to follow such a man was in itself a compliment. From the very first he was a most active director, and as early as 1875 became Deputy-Chairman, succeeding to the chairmanship in 1893. On some railways the chairman, if not a figurehead, has at times been overshadowed by the personality of the chief executive officer, but this has certainly not been the case on the Great Eastern Railway during the past 30 years. As stated in some of his recently-published railway reminiscences, whilst still Deputy-Chairman, Lord Claud Hamilton constantly urged the purchase of the London, Tilbury and Southend Railway, but his views were disregarded, and the opportunity went by. Two very popular and successful developments on the Great Eastern Railway, in which he has always taken the keenest interest, have been the Continental traffic and the conduct of the hotels and refreshment department under the direct management of the company.

The appointment of Sir Henry Thornton to be General Manager of the Great Eastern Railway brought Lord Claud Hamilton into considerable public prominence early in 1914. This was chiefly on account of his supposed depreciation of British railway talent. So far as the appointment itself was concerned, it soon proved to be extremely popular, and brought about still more cordial relations between management and staff. At the age of eighty, Lord Claud Hamilton has retired from the Chairmanship of a great English railway in full vigour of mind and body. It is unusual, to say the least of it, to have the Chairman greeted at the annual meeting with the singing of " For he's a jolly good fellow." But we are very glad the shareholders of the Great Eastern Railway at its last meeting thought of this tribute to a very engaging personality.

Rail Damage on Irish Railways.

NEWSPAPER references indicating the frequency and severity of damage inflicted by rebel agents on railways in various parts of Ireland will be familiar to most of our readers, but it requires a map such as that issued with the annual report of the Great Southern and Western Railway Company to emphasise the extent to which such damage has been done. The map is marked in colours classifying permanent-way damage (375 cases), under-bridges damaged (207 cases), over-bridges damaged (48 cases), signal cabins completely destroyed (71) or damaged (12 cases), buildings destroyed by fire (13), and engines, carriages or other rolling-stock derailed or destroyed (47). The fact that the markings corresponding to each of these headings are dotted over virtually the entire system, frequently to so great an extent that the coloured dots by which they are indicated are crowded together on the map as closely as they can be placed, shows how serious the situation has become. It is also mentioned that there were, between June 28 and December 31, 1922, both days inclusive, 302 instances of signalling instruments being destroyed or damaged, while there were 200 cases of stations and trains raided and goods stolen. The directors in their report point out that the railway has been subject to an intense campaign of destruction by

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the forces opposed to the Government of the Free State, and that, from the very commencement of hostilities, the Great Southern and Western Railway has been a principal object of attack, being apparently looked upon as the lines of communication of the National Army and therefore damaged with the object of preventing the movement of the National troops. Claims for compensation in respect of these damages have been made on the Government. It was pointed out that the maintenance of lines of communication should be regarded as part of the necessary cost of the war, and should be borne by the nation, instead of throwing the obligation on the shareholders, and terms similar to those granted by the British Government during the European War were asked for. The Government declined to do this or even to meet the payment of debenture interest, which is a first charge on the income of the company, the non-payment of which would disastrously affect the credit of the undertaking. Under these circumstances the directors considered it advisable in the interest of the proprietors to continue the running of the railway as long as possible in their own hands. In view of these conditions, and the fact that damage to lines and rolling-stock involves delay, if not cessation of traffic, it is not surprising that, for the year 1922, expenditure has slightly exceeded gross receipts, and that it is only by using £550,000 from the compensation received under the Irish Railways (Settlement of Claims) Act, 1921, that it has been possible to declare a dividend equal to 3 per cent. on the ordinary consolidated stock for the year.

Christmas Day.

PUBLICATION in a spring number of the RAILWAY MAGAZINE of a "Pertinent Paragraph" under this heading may seem somewhat out of place, but there is a great deal to be said for a suggestion in regard to Christmas Day made by a New Zealand reader, which justifies its appearance at this date. In sending a selection of distinctly remarkable photographs, Mr. W. W. Stewart, of Auckland, New Zealand, mentions that "The International Association of Railway Correspondents," a body which has been constituted for the association by correspondence of readers interested in railways in all parts of the world (Mr. Stewart, whose address is 44, Eden Vale Road, Mount Eden, Auckland, is the New Zealand representative), has for some years adopted the practice of exchanging railway photographs taken on Christmas Day, and suggests that if readers of the RAILWAY MAGAZINE would endeavour to take views next Christmas Day and forward to us, the resulting selection would be of widespread interest.

We gladly support this suggestion, without however, promising that all photographs which may be sent in can be reproduced.

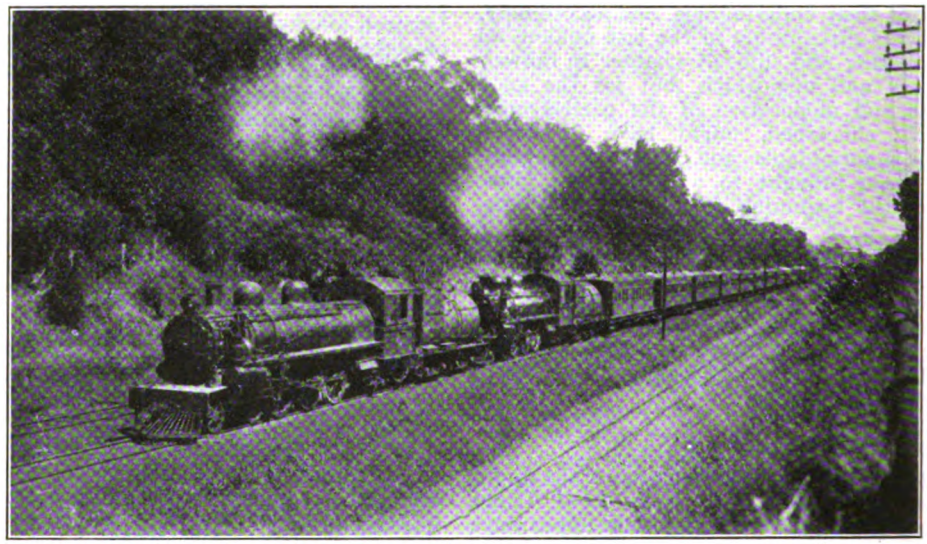

Photo.] NEW ZEALAND GOVERNMENT RAILWAYS. [*W. W. Stewart.*

"Thames" Express from Auckland, on Parnell Bank. 4-6-2 Locomotives Nos. 759 and 752. Photograph taken on Christmas Day, 1922.

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It may be, indeed, that in some countries, and there are none where the RAILWAY MAGAZINE does not possess direct subscribers or readers, Christmas Day, 1923, may be a day entirely unsuitable for photography. But we should have for consideration a remarkable series of views, suggestive of all conditions, ranging from the extremes of winter to the eternal spring of climatically-favoured lands, and the burning sun of tropical and semi-tropical countries. Readers are, therefore, invited to support this suggestion, of which they are advised in good time.

Meanwhile, one of Mr. Stewart's photographs, taken on Christmas Day, 1922, under the conditions of a New Zealand summer, is reproduced. It shows the 9.12 a.m. "Thames" express from Auckland on the Parnell Bank. It is double-headed, both engines, Nos. 759 and 752, being of the 4-6-2 class. A second view is reproduced on another page, showing the 4.13 p.m. Auckland-Papatoetoe train leaving Greenlane, worked by one of the 4-6-4 tank engines, No. 686.

Irish Railway Amalgamations.

SINCE the request by the Irish Free State Government for action by the railways in the direction of either unification or grouping, the companies have been making the most exhaustive examinations of their own positions and of that of the Irish railway system in general. The latest rumour, which so far lacks definite confirmation, is that of an amalgamation between the Great Northern and Midland Great Western Railways. Taken together these two companies would form the largest railway system in Ireland, with a combined issued share and debenture capital of £15,820,698 and a route mileage owned of 1,100 or a total mileage (reduced to single track) of 1,511¼. The difficulty, of course, is that, while the Midland Great Western system lies wholly within Free State territory, the Great Northern has headquarters and terminus in Dublin, and also termini in Belfast and Londonderry, whilst it is joint owner with the London Midland and Scottish Railway, of the County Donegal Joint Railways. Before the sitting of the Free State Railway Commission provisional arrangements had been made for the amalgamation of the Cork, Bandon and South Coast Railway with the Great Southern and Western. These are for the moment in abeyance. The total route mileage owned by these two companies is 1,068, and their combined capital issued is £15,127,391.

Modern Passenger Stations.

ON Tuesday, February 21, Mr. F. Bushrod, O.B.E., Assistant Superintendent of the Line, London and South Western Section, Southern Railway, delivered a lecture on "The Modernisation of Passenger Railway Stations," to the graduates and students of the Institute of Transport. The lecture, which was illustrated by lantern slides, prepared from plans and drawings by Mr. J. F. S. Tyler, was of a most comprehensive character. After dealing with the various types of stations and the factors calculated to influence design and lay-out, Mr. Bushrod stressed the importance of a proper arrangement of station offices and conveniences. He also dealt with the situation of locomotive depôts and carriage sheds in relation to the stations and urged, as a fundamental principle, that where traffic commenced and terminated, there engines and coaching stock should be berthed. The influence of electrified working on passenger station design was also reviewed by Mr. Bushrod, who explained the different conditions to be met, and emphasised the need for careful attention to the location of platform entrances in the interests of even and speedy train loading. Many other points of importance were brought out in this interesting lecture, including the effect of station design on the construction of time-tables, the relation between station lay-out and signalling arrangements, and the utility of automatic signalling. The methods of working at several of the stations illustrated by lantern slides were also analysed by Mr. Bushrod in order to show the advantages of different types of track arrangement and station lay-out.

The Stratford and Moreton Tramway.

IN response to questions raised by Mr. H. M. Pearson and by Mr. R. T. Ninnis, Mr. W. T. Perkins, of Henley-in-Arden, a contributor who has dealt with many of these little known lines, writes as follows: This line, connecting Stratford-on-Avon and Moreton-in-the-Marsh, was opened for traffic in September, 1826. It was of standard gauge, and the permanent-way consisted of fish-bellied iron rails 15 ft. in length, laid in chairs affixed to stone sleepers. A branch was soon afterwards constructed from near Ilmington to Shipston-on-Stour. It was always worked by horse-power, never by locomotives, and was not a financial success; a passenger service was tried for a short time in the "fifties," but was soon discontinued. When the "Oxford, Worcester and Wolverhampton Railway," was constructed, the tramway (which joined their line at the Moreton end) was taken over by that company, and passed successively into the hands of the West Midland and the Great Western, being still the property of the latter. For many years the

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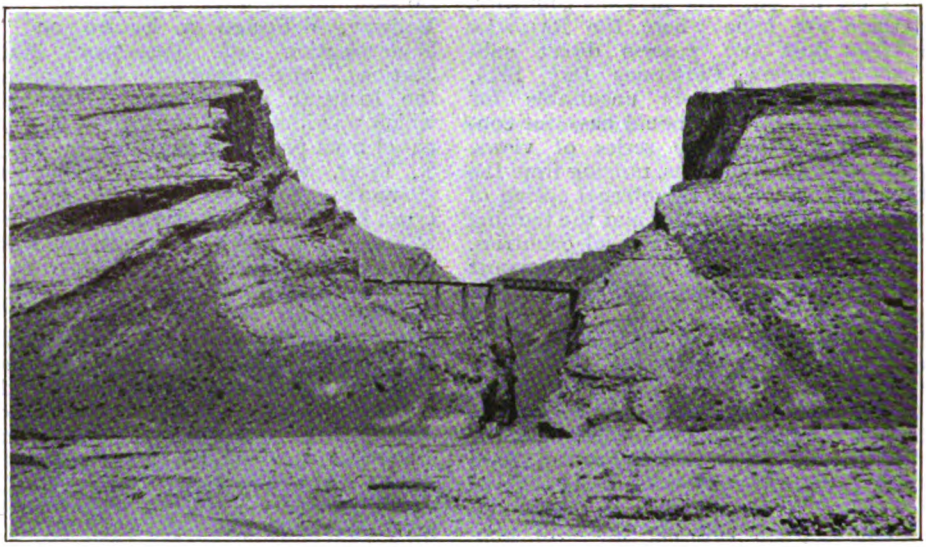

GORGE IN THE CHAPPAR MOUNTAIN.

The view shows how the famous rift is bridged.

northern portion of the line lay derelict, but the Moreton-Shipston section was reconstructed in 1889, and has since been worked as a passenger railway. In 1918 the rails and chairs were removed from the disused half, and sold to the Government to be melted up for use in munition factories, but the stone blocks still remain. Its resuscitation is extremely improbable, as the Great Western Railway already possess a fairly direct route between Moreton and Stratford via the Honeybourne east loop.

A short length of the original permanent-way may be seen in the Bancroft Gardens at Stratford; another section is preserved at Henley-in-Arden, the latter town having been the birthplace of the promoter and engineer of the line—William James, who is sometimes called "The Father of Railways." (*See* RAILWAY MAGAZINE, vol xi, p. 404, for view on the line; vol. v, p. 35, for a map; and vol. xviii, p. 448, for illustration of its rolling-stock.)

Chapper Rift Bridge.

WE are indebted to Mr. Harold P. B. Hoare for two interesting photographs of this famous bridge on the Baluchistan section of the North Western State Railway of India. Mr. Hoare writes as follows: "The Chappar Rift was the chief difficulty met with in the construction of the Baluchistan section of the North Western Railway of India. The Rift is a huge gorge traversing the Chappar Mountain at right angles to its general strike. It is crossed by a single-span bridge—150 ft. long and 234 ft. high—which is reached by tunnels excavated in the solid rock with the aid of adits horizontal to the face of the cliffs.

The line was constructed at an enormous cost—about £20,000 to the mile—and it is undoubtedly one of the finest examples of railway engineering in the world. Begun in 1879, it was not completed to Chaman, on the Afghan frontier, until 1892."

New Four-Wheeled Coaching Stock for Edinburgh Suburban Services, London Midland and Scottish Railway.

ALTHOUGH it is contrary to usual practice nowadays, when building new coaching stock for suburban traffic, to construct vehicles on the four-wheeled principle, there is something to be said for the plan on the score of economy both in respect of the first cost and that of maintenance. Provided that the permanent way is well maintained and of a suitable character to ensure smooth running, also that in respect of body construction and equipment the vehicles conform to modern ideas, the substitution of four-wheeled for bogie carriages in suburban areas where the runs are not of long duration has something to recommend it. Occasionally, too, special conditions apply, as in the case of the new sets of four-wheeled coaches, introduced for use on the Balerno branch from Princes Street, Edinburgh, as

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referred to in the January, 1922, RAILWAY MAGAZINE.

For this service several set trains have been introduced, each comprising two first-class, four third-class, and two brake third-class carriages of the four-wheeled type, an addition being effected in the make-up of the trains on Saturdays when they are augmented by three third-class carriages and one third-class brake. The total length of each train over buffers is 259 ft. 4 in. normal and 391 ft. with the augmented trains. Total weights for each train are 111 tons and 166·5 tons respectively.

The first-class carriages are 28 ft. 10 in. long, by 9 ft. 10 in. wide over body, and the third-class and brake third-class, 30 ft. 10 in. long by 9 ft. over body. The underframes are constructed of rolled sections and plates with headstocks of pressed steel and the wheels are of rolled forged steel disc type with steel tyres. The carriages are fitted with Westinghouse brake, the brake third-class carriages having hand brake in addition. The bodies are constructed mainly of teak framing. Upholstering is in the Caledonian Railway Company's usual style, the third-class being finished in rep and the first-class in moquette. The doors are finished in embossed leather. The floors are covered with linoleum in each class, the first-class also having velvet pile rugs and horsehair rugs in the smoking compartments. The doors are fitted with Kaye's patent locks and handles and spring blinds are fixed to the compartment windows. The carriages are fitted throughout with the Westinghouse Company's system of steam heating, each compartment having the heater placed under the seat. The brake compartment is also fitted with a heater. Stone & Co's electric lighting is fitted to all the coaches, each brake third-class carriage being fitted with a dynamo and accumulators. The dynamo is suspended from the underframe and driven by belt from a pulley fixed to the axle. The accumulator boxes are also carried from the underframe. Other electrical equipment is arranged inside a locker placed in brake compartment. The painting is carried out in the railway company's usual colour.

The London and North Eastern Railway and Coventry and Birmingham.

FOR several years past, right up to the Government grouping scheme, Coventry firmly believed that the Great Central Railway was on the eve of promoting a line to that town. Some people in the district went further and claimed that the railway would be continued to Birmingham. Doubtless, the Coventry project was on more occasions than one carefully and fully discussed at Marylebone. Many factors in the past prevented the fruition of such a project and now the grouping has practically eliminated future competition dependent upon the construction of expensive new lines. Coventry, with a population of 110,000, is still dependent upon the London

CHAPPAR RIFT BRIDGE.
A notable feat in construction work on the Baluchistan Section of the North Western Railway of India.

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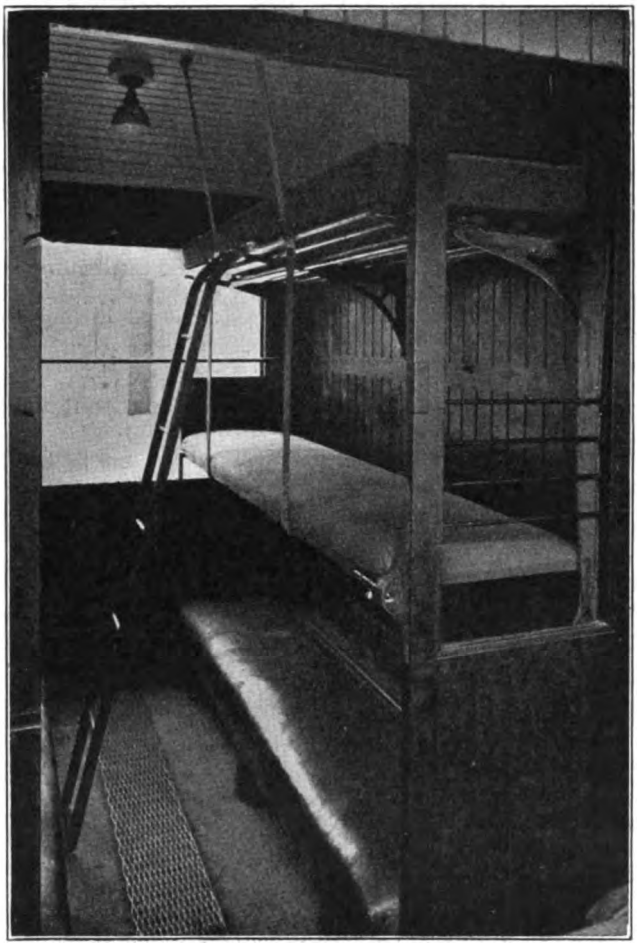

THIRD-CLASS COMPARTMENT ARRANGED FOR NIGHT USE, FRENCH STATE RAILWAYS.

Midland and Scottish Railway, which gives it a most excellent service. Birmingham is served by the Great Western Railway and London Midland and Scottish Railway from London. The London and North Eastern Railway has no direct access to Birmingham. The large goods and parcels traffic from the North and from Scotland originating on the London and North Eastern system for Birmingham is as far as practicable conveyed by the Great Central route to Banbury, and reaches its destination by the Great Western Railway.

Present working arrangements between the London and North Eastern Railway and the Great Western Railway are consequently on a satisfactory basis. The pre-grouping idea of the Great Central Railway serving Coventry was doubtless founded on the circumstance that the mileage from London would be practically the same as by the London and North Western Railway. The district between Rugby, Coventry and Birmingham is, however, so well covered by the lines of the London and North Western Railway that it would prove difficult for a new comer to construct a route that did not parallel existing facilities.

Second and Third Class Sleeping Cars on French Railways.

ATTACHED to one of the night trains running between Paris and Brest, on the Chemins de Fer de l'Etat, is a joint second and third-class sleeping car. The coach, which is said to be unique in Europe constitutes an experiment arranged on the initiative of M. Le Trocquer, French Minister of Public Works. Should it prove popular, the experiment will be extended to the Paris-Bordeaux and Paris-La Rochelle lines of the same system and be copied by the five great privately-owned railway lines of France. Engineers of the State lines have been studying the means of constructing second and third-class sleepers ever since May last when the Minister made his suggestion. The essence of the problem was how to find space in an ordinary compartment for six berths, three on each side. It would have been simple to arrange for four berths, on the model of the first-class couchette, but this would have reduced the carrying capacity by half and rendered necessary a corresponding increase of prices. The solution worked out by the designers is ingenious, even if it involves rather cramped accommodation for the traveller.

The lower berth naturally consists of the seat in ordinary use by day, the upper cushion being removed in order to give room for the berths above. The middle berth is provided by the back cushion of the seat, this being raised by a pivot and held in position by two legs below and two straps above. The upper berth is a development of the light luggage rack, composed of slats and possessing a fold which gives it the required breadth, while two straps attached to the roof support it in position. The top cushion of the seat supplies the bed. To each berth hangs a net bag to contain the

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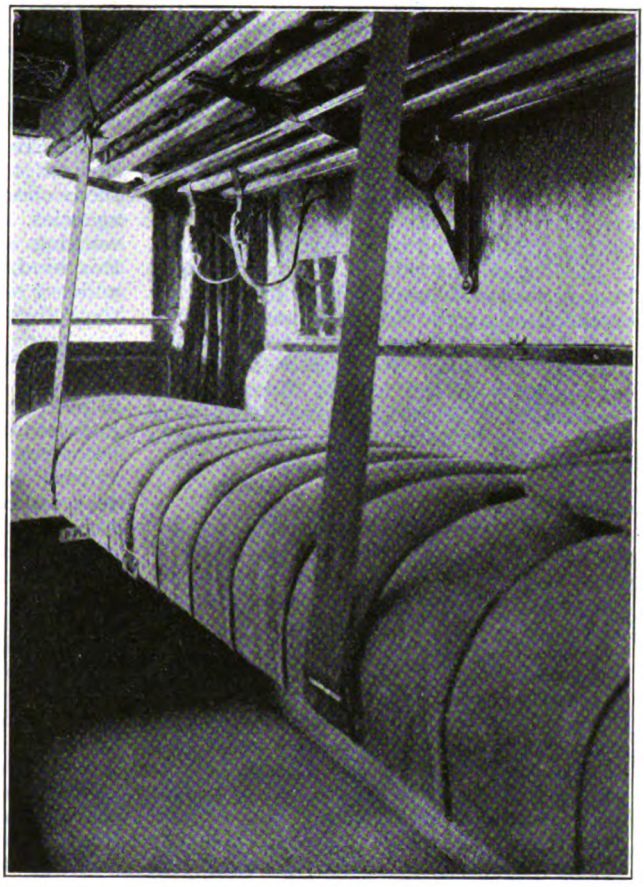
sleeper's clothing, and a removable iron ladder in the centre of the compartment gives more or less easy access to the two upper berths. The arrangement is the same in both the second and third class compartments, but in the former the three arm-rests or cushions are used as pillows for the three berths and the upholstering is, of course, much better, giving to the compartment a much more comfortable appearance than that possessed by the third class sleeper. In both sleepers, however, it is impossible for the occupant of a berth to sit upright.

As regards prices, these have been provisionally fixed for the third-class sleeper at a figure just below the cost of a second-class seat, and for the second-class sleeper at a little less than the cost of a first-class seat. They vary according to distance as follows :—

	2nd class.	3rd class.
	fr. c.	fr. c.
Up to 250 km. ..	16 65	11 60
,, 500 km. ..	24 95	17 45
Over 500 km. ..	29 40	20 35

For a journey of 500 km. the traveller pays 105 fr. 65c. for a first-class seat and 94 fr. 55 c. for a second-class sleeper; a second class seat costs 69 fr. 60c. and a third-class sleeper 61 fr. 75 c. or about 18 fr. more than a third-class seat. The design is tentative and is likely to undergo modifications in detail as may be suggested by experience, but the novelty is at least indicative of a welcome desire on the part of the authorities to make travelling by second and third class more comfortable.



SECOND-CLASS COMPARTMENT CONVERTED FOR NIGHT USE.

Jubilee of Track Circuiting.

IT was not till 1878 that track-circuiting was first officially applied to British railway operation. This initial installation was at the St. Paul's station of the then London, Chatham and Dover Railway, and was the work of the late Mr. W. R. Sykes, the track-circuiting being brought into operation contemporaneously with the opening of the station.

Track circuiting has, however, already passed its jubilee; the master patent is dated August 20, 1872, in the United States Patent Office, the patentee being William Robinson, an Irishman, who was 32 years old when his patent was granted. For several years track-circuiting made little progress. The Philadelphia and Erie Railroad was the first to authorise an installation of Robinson's system, which was done under the advice of Mr. W. A. Baldwin, the General Superintendent of the Philadelphia and Erie Railroad. Although, during the past 15 years, track-circuiting has made headway in Great Britain, it is only within the last few years that considerable use of it has been made on United States railroads, but during this period installation has been rapid. Since January, 1921, more than 56,000 miles of railway have been provided with the automatic block in the United States by means of track circuiting. In connection with these installations some 60,000 relays are employed.

Scope for a New Tube.

WHEN prices have reached a level that financiers think *tube* construction may prove profitable, there is yet a district in London

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and the Northern suburbs unprovided with a *tube*. Such a line might start at Ludgate Circus (continued by a loop to Blackfriars to connect with the Metropolitan District Railway, and to avoid a terminus), proceed under Bride Street to Holborn, along Holborn, down Gray's Inn Road to King's Cross, beneath the Caledonian Road to the "Nags Head," Holloway, under the Seven Sisters and Hornsey Roads to Hornsey Rise and through Crouch End to the Alexandra Palace at the foot of Muswell Hill. Hence it might be continued to Muswell Hill and in the future extended through Finchley and Regents Park Road to Golders Green, there joining the existing *tube*. A branch might be considered from the foot of Muswell Hill, beneath Priory Road to Hornsey, thence *via* Green Lanes to Wood Green and across to the Edmonton district.

Spéditeurs.

REFERRING to the system adopted on many Continental railways, whereby goods traffic on a small scale is dealt with by what are known as "spéditeurs," or forwarding agents, "Polyglot" suggests that similar methods would be of material assistance in solving the problem with which British railway officers are faced. There is certainly something to be said for the suggestion, but it has to be remembered that in many parts of the Continent these "spéditeurs," or forwarding agents, do work which is at present dealt with by the collection and delivery departments of British railways. The same applies to the American express system. As a means for obtaining co-operative loading the system has, of course, much to commend it, but it is well to remember that much of the value of the transport services provided by British railways is that traders and others are able to deal direct with the railway companies without intermediary agencies. In fact, one of the reasons why the rates and charges of railways in other countries appear so much less than those of the home railways (of which so much was made before the war, though the situation is now much less marked), is that British railway companies render much greater services than those of most other countries, where the charge is little more than that for actual conveyance, other services rendered being made the subject of supplementary charges or worked through "spéditeurs," or express companies.

In modern goods traffic working the tendency is to encourage co-operative methods of loading or of holding up consignments until they aggregate sufficient quantities to justify lower charges, in order that the railways may themselves be able to carry the traffic more economically, and it is quite likely that special reductions in rates and charges will be largely based upon this being done. To suggest, however, that such systems should replace present arrangements would require radical alterations in British railway methods as a whole, and if the difficulties of the situation can be solved by methods such as those which are being developed, there should be no need for intermediary agencies. To some extent, of course, forwarding agents already render services of this kind, though as a matter of business and not with any direct object of assisting the railway companies.

"Railwayism."

MR. G. W. BISHOP, of Kenilworth, passes some pertinent remarks in regard to the interest taken in railways and locomotives by so many people who are not engaged in railway service or associated with the railway industry in any way. Advisedly, he objects to the term "railwayac" and its alleged derivation from "railway maniac," pointing out that the RAILWAY MAGAZINE was always strongly adverse to this description of people who are interested in railways. He prefers, as we do ourselves, the term "railwayist," in so far as a special description appears to be necessary, though, as our pages during recent years will indicate, we have avoided using either form wherever practicable. He argues, also, that there should be a collective term to indicate the railway interest as a whole, and suggests that "railwayism" would be the most suitable word. No alternative appears, indeed, to be available, for a term such as "railwayology" is much too awkward for general use. If any of our readers have useful ideas on this point, we shall be pleased to consider them.

Great Northern Suburban Time-keeping 30 years ago.

A QUESTION recently asked in Parliament with reference to business hours traffic on the Great Northern Railway, brings to mind the conditions existing prior to the opening of the third Gas Works tunnel in 1892. Thirty-one years ago, there were no tubes from Finsbury Park to King's Cross and Moorgate, and no fast-travelling electric trams and motor 'buses from Finsbury Park to all parts of London. The huge morning up and evening down traffic (apart from that to and from Broad Street) passed over the Great Northern Railway between Finsbury Park and King's Cross.

The delays to up trains were serious and chronic. In the first place, trains had tickets examined and/or collected at Holloway—York Road being an open station. There were only two up roads through the Gas

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Works tunnels, all empty trains for down main line traffic, being worked over them in addition to the up passenger trains. The eastern line serving York Road was reserved for the Moorgate Street and South of Thames trains. Some of the Moorgate Street morning trains were strengthened by the addition of two or three coaches for King's Cross terminus. The engine and these coaches ran through York Road and were detached whilst the rest of the train was alongside the platform. The front part drew forward a few yards into the terminus at No. 1 arrival platform. A condensing engine which stood in a short siding between the terminus road and the line to King's Cross Metropolitan, then backed on to the remainder of the train, and took it on to Moorgate Street.

The Demonstration which never took place!

THE biggest delay occurred in the arrivals of suburban trains at the terminus; one up road through the tunnel (as explained above) having to accommodate all terminus trains, including empties. Passengers were getting more and more exasperated at the chronic unpunctuality of up business trains, and at last a group of passengers by a certain morning train arranged to proceed *en masse* to Sir Henry Oakley's Office—he was always there at 9.0 a.m.—force their way into his presence, and give him their views on the subject in unmistakably emphatic language. The railway officials knew nothing of the proposed raid on the General Manager, and the conspirators were only awaiting their train to be 11 min. late, to take action, when one fine morning in 1892, the additional tunnel was opened, and trains ran to time, so the intended interview with Sir H. Oakley never took place. When tickets were collected at Holloway, many boys used to take advantage of the circumstance to obtain a free train ride from York Road to King's Cross, Metropolitan.

Multiple Train Working under difficulties.

MR. ERIC CRICKMAY, writing from New York, sends an advertisement issued by the New York Central lines to the effect that "through the heavy storm on Sunday night (January 7) the New York Central lines were called upon to carry the greatest volume of overnight traffic to New York from the West and Canada ever brought into the Grand Central Terminal. Ten overnight trains were operated in twenty-six sections, the 'Twentieth Century, Limited,' for the first time in its history running in five sections. The severe operating conditions forced delays, in spite of the unrelenting efforts of the men in the operating department to maintain the high standards of new York Central service. The bulletin of incoming trains at the Grand Central Terminal on Monday morning—from Chicago, Cleveland, Detroit, Toledo, Indianapolis, Cincinnati, Toronto, Buffalo, Montreal, and other cities—presented the following story of this high tide of traffic:—

Twentieth Century Limited	Five sections.
Hudson River Limited ..	Two sections.
Fifth Avenue Special ..	Three sections.
The Wolverine	Two sections.
The Detroiter	Five sections.
The Beaver	Two sections.
New York Limited ..	Two sections.
New York Special ..	One section.
Atlantic Express ..	Two sections.
Montreal Express ..	Two sections.

These overnight trains brought into New York 4,028 sleeping car passengers, and breakfast was served to 2,958.

Empty Passenger Trains for Week-end Traffic.

THE week end coast traffic from Glasgow by all routes is extremely heavy during the summer. Many express trains are run soon after mid-day on Saturdays, with return trains on Saturday night and early Monday morning. This means that coaching stock has to be worked to the coast stations empty for certain of these services to Glasgow. As an example of last summer's working, a train on Saturdays only ran from St. Enoch at 2.2 p.m. to Largs, and a Saturdays only train left Largs at 7.45 p.m. for Glasgow, while among other trains was one at 5.50 a.m. Mondays only. The stock having made an up and down journey loaded on the Saturday had to make an empty journey from Glasgow to Largs, for use in the Monday's only train. Last summer the empty coaches were timed to leave the Bellahouston sidings at 4 a.m. and were due at Largs at 5.18 a.m. Other trains of empty coaches for these return week-end services left Bellahouston at 4.30 a.m. for Largs and at 4.45 a.m. for Fairlie Pier. An empty train also left Glasgow (St. Enoch) at 3.45 a.m. for Fairlie Pier on Mondays only. These four trains of empty coaches to the Largs section, represented empty passenger train running of 160 miles every Monday during the season

A Notable Light Railway in China.

FROM particulars issued by the Chinese Government Bureau of Economic Information, considerable interest attaches to the completion, last November, of the Ko-Pi Light Railway from the main line of the Yunnan-Tonkin Railway at Pishihchai to the mines at Kokiu. The construction of this line was a remarkable engineering feat, for which all the credit should be given to Mons D. Niflis, a French engineer, who practically built the line single handed. The

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company was formed in 1914, mainly among the smelters, mine-owners, and tin sellers of Kokiu, with a capital of $2,800,000; but this sum was not enough to cover the cost of the line, owing both to the rise in salaries demanded by the labourers and to the increase in all prices caused by the Great War. Great difficulties were met when the construction of the line, during the years 1919-20, reached the difficult country between kilometres 42 and 62, and, as this time coincided with the slump in tin, it was very difficult to induce the shareholders to subscribe the increased capital which was required. Although Mons Niflis was only engaged for the survey and designing of the line, yet he actually directed and supervised the construction of the whole line, which is 72 kilometres in length and possesses eight tunnels and many viaducts and bridges, while it has to ascend 600 metres and cross two ranges of mountains to reach Kokiu. His only assistants were young Chinese students, whom he taught and trained. The rails were made at the Hanyang Ironworks, the cars and fittings at the Yangtze Engineering Works, and the locomotives were bought in America. The transport of tin from the mines to the main line of Pishihchai, and the conveyance among other things of rice, coal, charcoal, wood, and oil to Kokiu, should ensure the success of this enterprise.

Wortwell Station.

REFERRING to the illustration in the February RAILWAY MAGAZINE showing Wortwell station, on the Great Eastern section of the London and North Eastern Railway, the Rev. H. P. Hart, of Bury St. Edmunds, points out that in an 1865 *Bradshaw* both Wortwell and Redenhall stations are shown, all trains stopping when required to take up or set down. The next issue of *Bradshaw* in his possession is that for 1873, in which year Wortwell remained in use, the stops being conditional, although Redenhall was apparently no longer open. In an 1882 *Bradshaw* both stations had disappeared.

Commenting upon the same matter, Mr. H. Wilkes, of Ipswich, a retired station-master, writes that he was one of the staff that left Ipswich by special train on the occasion of the opening of the line between Bungay and Beccles on March 1, 1863. He was left in charge of Ellingham station for a few days, and then transferred to Redenhall, where he remained for a few months. He also confirms that both Wortwell and Redenhall stations were in use for some time, though neither correspondent is able to give exact dates as to when they were closed, neither have we been able to ascertain this information from other sources.

The former correspondent, the Rev. H. P. Hart, asks for further information as to Bristol and Exeter Railway tickets still in use, as mentioned in the "Pertinent Paragraph" on page 168 of the February number. Possibly "C.R.C." may care to communicate with the Rev. H. P. Hart, care of this office. The last-mentioned gentleman states that in July, 1910, a Great Western return excursion ticket to Mutley (Plymouth) was issued to him at Hammersmith, on which was printed the words "Closed Carriage." This issue of tickets, he was informed, had been at Hammersmith for many years, a period of 50 or more being suggested.

Some Irish Queries.

Two queries received from G.R.M. in regard to Irish railways introduce matters of considerable interest in reference to which little is known generally, and in view of the very full information supplied in response to our request by Mr. R. D. Griffith, Secretary and Accountant of the Dublin & South Eastern Railway, the material thus available is utilised in this section instead of under the "Why and the Wherefore" heading. In regard to the Bray and Enniskerry Railway statutory authority was obtained for the building of this line under the Bray & Enniskerry Light Railway Act, 1886, the authorised capital being £30,000 in 3,000 shares of £10 each. The number of directors was fixed at three, and two of the first directors were named, viz.: John Shanks and Alfred Killingley. A portion of the capital was subscribed, and the work of levelling, &c., commenced at certain places, but the scheme quickly fell through, and, so far as is known, the land purchased now lies either derelict, or squatters' titles have been established by local residents. About six years ago the Dublin & South Eastern Railway Company endeavoured to reclaim a piece of the Bray and Enniskerry Company's land adjoining their station, and on which it was intended that that company's trains should enter the Dublin and South Eastern Bray station. It was found, however, that a squatter claimed the ground, and sleepers dumped on it several times were thrown out on each occasion. It was ascertained at that time that the Bray and Enniskerry Company had dissolved, and had no representative.

With reference to the Wicklow Tramway, authority to construct the tramway was given under the Wicklow Urban District Council Order of 1905. The construction was carried out by the Right Hon. Earl Fitzwilliam, who, by agreement dated July 2, 1906, placed it under the management and control of the Dublin and South Eastern

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Railway Company, the terms of the agreement being that the company should bear all expenses of maintenance, repairs and renewals, and make what they could out of it by receipts. The tramway runs from the Dublin and South Eastern Railway Company's Wicklow goods station to the Wicklow harbour quays, but as the coastal trade of Wicklow harbour is very small, it is very rarely that the quays are used, and the tramway is more or less an incumbrance, as little or no traffic is obtained and the roadways have to be maintained to the satisfaction of the Wicklow Urban District Council.

Automatic Signalling on the Mersey Railway.

THERE has recently been erected on the Mersey Railway a signalling installation which is of a unique character, since it includes the automatic operation of points. Just over 12 months ago, there was brought into service on this line, and has since been operating most satisfactorily, a system of automatic signalling between Hamilton Square, Birkenhead, and Liverpool Central (Low Level) stations. This signalling arranged for additional signals in the river section of the tunnel, and was of particular technical interest, in that the track circuits had probably the lowest ballast resistance of any previously installed.

At that time the signalling at Liverpool Central (Low Level) station, was still of the mechanical type, and SYX lock-and-block instruments were fitted at the two cabins. The increasing traffic on the Mersey Railway caused the General Manager and Engineer, Mr. J. Shaw, M.Inst.C.E., to consider the question of improved signalling arrangements at this station, which would enable an even more frequent service of trains to be run. As a result of his study of the conditions, Mr. Shaw decided to take advantage of the latest appliances now available, and install at this station apparatus which would arrange for the throwing of a cross-over road and a pair of catch-points, with their necessary signals, automatically.

The station, which is the Liverpool terminus of the railway, has one island platform. Trains from and to Birkenhead arrive at and depart from the west end of the station, while at the east end Nos. 1 and 2 platform roads are extended to form Nos. 1 and 2 sidings. A cross-over is provided to enable trains to shunt from No. 2 platform road to either No. 1 or 2 sidings, and is so situated that a train arrives and stops at No. 2 platform just clear of the cross-over road. A time arrangement is installed, which takes 20 to 30 seconds to operate, and ensures that the train remains within a certain section of the platform road for a definite time, this time being of sufficient length to ensure that the train shall have come to rest. At the expiration of this time, the cross-over is reversed, and the signal is cleared for the train to run into No. 1 siding. When this train is in the siding, the cross-over is again placed normal, and provided that the other road, No. 1 of the island platform, is clear of trains, a pair of catch points are reversed and the signal reading into this road is "cleared" so that the train may be reversed and brought to No. 1 platform, ready to load passengers for Birkenhead. For this train movement, no human operator is necessary in the signal cabins, but, should it be desired at any time to operate the points manually, it can be done by altering the position of a lever installed in the signal cabin, when the automatic working is put out of service and manual operation must be employed for the movement of points and signals.

The new system of signalling briefly outlined above was brought into use on February 4 and on the same day the Inspecting Officer of the Ministry of Transport carried out his inspection, and authority has been given to the railway to operate this new signalling. In extended trials made under service conditions the system has worked most satisfactorily. At a later date we hope to describe the system fully. The work of installation was carried out by the Mersey Railway under the instruction of the General Manager and Engineer, Mr. J. Shaw, in collaboration with the staff of the Westinghouse Brake and Saxby Signal Company, Limited, which company supplied the materials, and whose engineers designed the system.

Train Acceleration, London Midland and Scottish Railway.

THE first issue of time-tables covering the Western Division of the London Midland and Scottish Railway will become effective on April 2. Principal interest attaches to the improved and accelerated train services to be introduced, particularly those providing for trains between London and Manchester in 3 hr. 30 min., London and Liverpool in 3 hr. 40 min., and London and Birkenhead in 4 hr. 5 min. These accelerated times will be given by the 6.5 p.m. from Euston, due Manchester (London Road) 9.35 p.m.; the 9.45 a.m. from Manchester (London Road), due in London at 1.15 p.m.; the 5.55 p.m. from Euston, due Liverpool (Lime Street) 9.35 p.m.; and the 8.55 a.m. from Birkenhead (Woodside), due in Euston at 1 p.m. Several other trains are accelerated to less than four hours.

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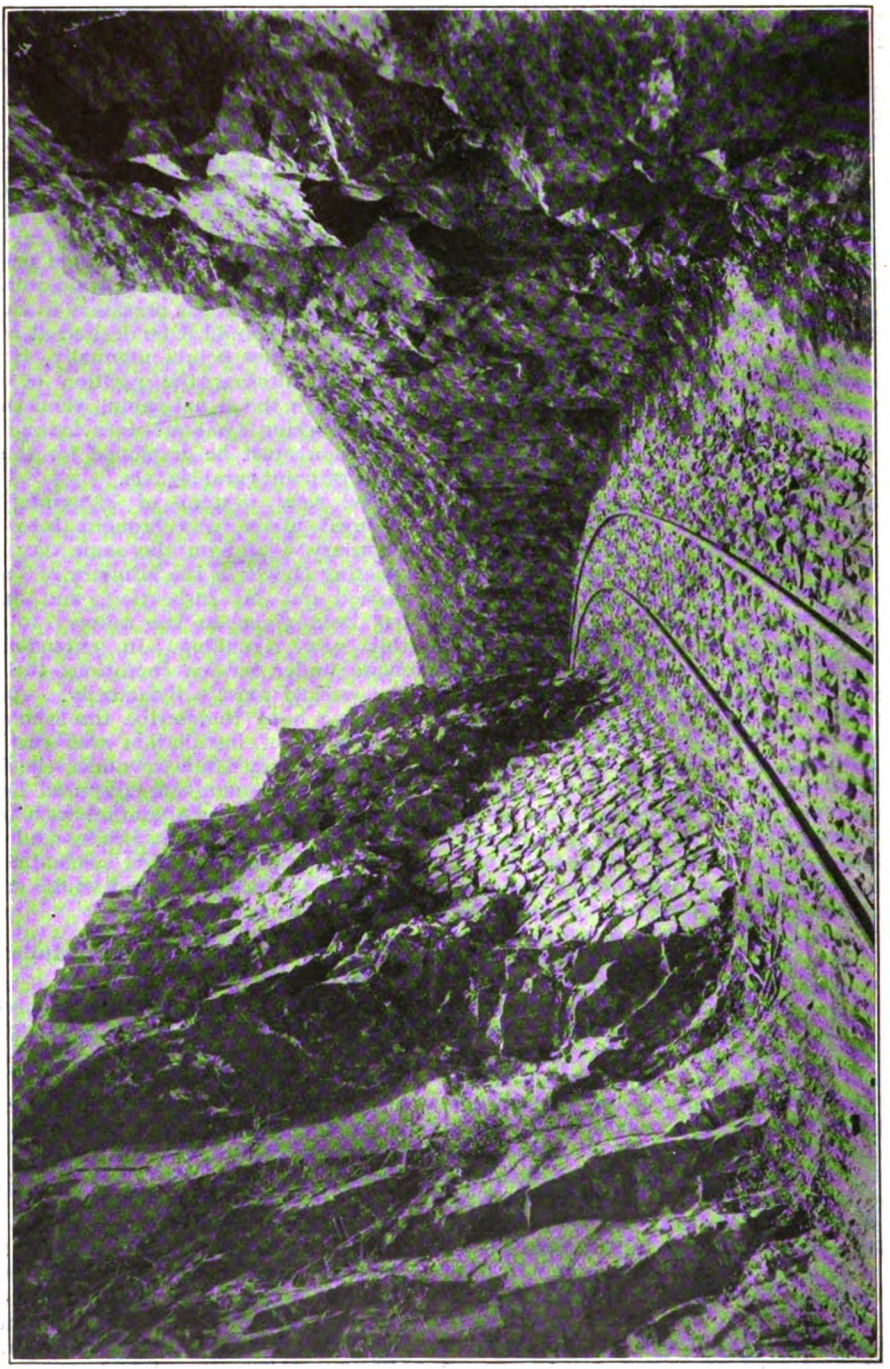
HEAVY ENGINEERING WORKS ON THE NIGERIAN GOVERNMENT RAILWAY.



ROCK CUTTING AT ZUNGERU, 424 MILES FROM LAGOS.

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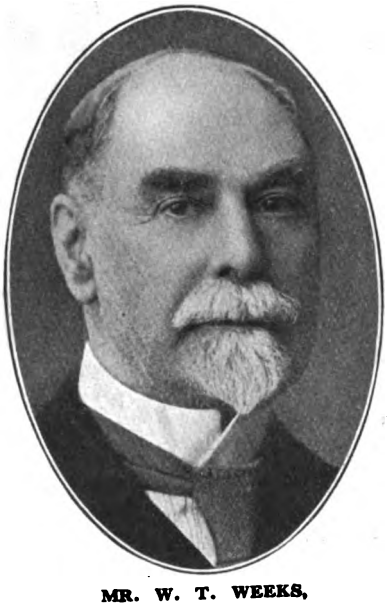
MR. W. T. WEEKS, who has been appointed Chief Stores Superintendent of the London and North Eastern Railway, has been in railway service since January, 1876, when he joined the Stores Department of the North British Railway at Cowlairs, Glasgow. After passing through the various sections of that department, he ultimately attained the position of Chief Clerk, and, in September, 1898, transferred to the Great Northern Railway as Stores Superintendent. Mr. Weeks held the position until his recent appointment as above.

* * *

LORD ANSLOW, at the final annual meeting of the North Staffordshire Railway Company, in paying a tribute to the retiring officers, said that what distressed the Board most was the future career of Mr. F. A. L. Barnwell, their very able General Manager. Mr. Barnwell had youth, energy, foresight, courage, perseverence, tact and good temper. He retired from a sphere of activity which was dear to him almost as his life, but he retired with the laurels of a most successful general manager and a wise and sympathetic commander-in-chief of railwaymen and women.



MR. W. T. WEEKS,

Chief Stores Superintendent,
London and North Eastern Railway.

* * *

MR. W. N. COX, late Chairman of the Highland Railway, and Lord Invernairn have handed over to the Northern Infirmary, Inverness, £1,053 the amount of their individual shares of compenastion on going out of office as directors, for the endowment of a bed in the infirmary, to be called the "Highland Railway Bed," to which Highland division servants of the London Midland and Scottish Railway will have first claim.

* * *

A TRIBUTE to Mr. David Cooper was paid at the final annual meeting of the Glasgow and South Western Railway Company by the Chairman, Lord Glenarthur, who said: "Our third representative on the Scottish Committee is Mr. David Cooper, who joined the service in 1867, and has just retired from the position of General Manager, which he has held for 28 years. Mr. Cooper has won the confidence, the respect and regard of all connected with the railways. His example, his efficiency, his courtesy, have been a powerful influence for good, and we are much indebted to him for his skilful management."

* * *

AN appreciative reference to Mr. D. A. Matheson's services as General Manager of the Caledonian Railway, were made by Mr. H. Allan in his speech at the last annual meeting of the company. Mr. Allan said: "I have seen Mr. Matheson's work for many years, and I believe he is the best General Manager the Caledonian Railway has ever had. Of his services to this company it would be impossible to speak too highly. He has constantly devoted his great energy and ability to our interests; and it is largely due to his exertions, loyally supported by

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the principal officers, that this company has emerged from the recent difficult times in its present satisfactory condition. In testimony of our appreciation of his distinguished services to this company the board has awarded to Mr. Matheson the sum of £5,000 as a farewell gift, and I am sure that you will approve of this well-earned recognition of good work."

* * *

MR. W. M. TEASDALE, the Advertising Manager of the London and North Eastern Railway, was from December, 1920, until December 31, 1922, Trade Advertising Agent of the North Eastern Railway. During the latter period Mr. Teasdale conducted the business of the Trade Advertising Department of the North Eastern Railway under the supervision of the Passenger Manager, and was also responsible for the company's traffic advertising. He has had a varied experience in the passenger and operating departments. During a period of the war Mr. Teasdale was Assistant Traffic Manager and subsequently Traffic Manager of the Royal Arsenal Railway at Woolwich. During part of 1919 and 1920 he assisted with special work at headquarters in connection with the revision of rates and fares. Following the grouping of railways on January 1, this year, Mr. Teasdale received his present important post.

Elliott] [*& Fry.*

MR. W. M. TEASDALE,

Advertising Manager,
London and North Eastern Railway.

* * *

MR. T. C. JEFFREY has been appointed Superintendent of Advertising and Publicity of the new London Midland and Scottish Railway under the Chief General Superintendent (Passenger Commercial Section). Mr. Jeffrey joined the Midland service in 1880. In 1888 he became "personal" clerk to the head of the Passenger Trains and Train Working Office. In 1893 he was transferred to the General Manager's Department. In 1903 he was made Chief of the Advertising Office under the Superintendent of the Line. In 1909, when the Superintendent's Department was reorganised, Mr. Jeffrey continued as Chief of the Advertising Office, and was made responsible for all public notices and advertisements of the Midland Railway, also for supervising trade advertising, bookstalls, &c., at Midland stations.

W. W. Winter] [*Derby.*

MR. T. C. JEFFREY,

Superintendent of Advertising and Publicity,
London Midland and Scottish Railway.

* * *

THERE is no older railway institution than the Railway Guards' Universal Friendly Society, of which Mr. F. Blackbourn has been appointed Chairman of the Committee of Management. Mr. Blackbourn, as a boy,

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entered the South Eastern Railway service and became a brakesman in 1883. In the following year he joined the society under notice. After a time he was appointed Head Guard, and from that position to Control Inspector, owing to the increase in the goods traffic which had overgrown the siding accommodation. When Slades Green station was opened in 1900, Mr. Blackbourn was made stationmaster, and he was transferred to Maze Hill station and Stock Depot in 1913 and a few years later, Greenwich and Deptford stations were placed under his supervision. He retired in December, 1922, and the directors were pleased to show their appreciation of his services in a practical manner.

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MR. CECIL J. ALLEN, President, gave an excellent address at the annual general meeting of the Railway Club members at headquarters, 65, Belgrave Road, London, S.W.1, on February 16. The following officers for the ensuing year were elected :— Chairman of the Executive Committee, Mr. A. W. Bartlett, A.M.I.E.E.; Hon. Secretary, Mr. K. Ffitch; Hon. Assistant Secretary, Mr. W. J. Mitchelhill; Hon. Treasurer, Mr. L. H. Bailey.

* * *

ONE of the most pleasing and popular of the staff welfare auxiliaries of the London Underground Electric Railways and their associated omnibuses and trams is the T.O.T. Philharmonic Society. The ninth grand evening concert under its auspices was held in the Central Hall, Westminster, on February 28, when greatly appreciated items were rendered by the choir, orchestra, and military band of 300 members of the staffs, before a large audience. The programme was augmented by Miss Rosa Dallow, Mr. Edward Dykes, Mr. Fred. Milner and Mr. Arthur Meale. The latter, at the organ, had a tremendous reception. A number of leading officials of the companies were present, including Mr. H. E. Blain, C.B.E., Assistant Managing Director, London Electric Railway, who thereby demonstrated their sympathy with the keenness and enthusiasm of so many members of the rank and file in the cultivation of the art of music.

* * *

A VERY successful and enjoyable function was the third annual dinner of the London District Traffic Superintendent's personal office staff, Southern Railway (South Eastern and Chatham section), held recently at Charing Cross Hotel, Strand. Mr. E. J. Missenden, the London District Traffic Superintendent, who presided over the gathering, was supported by Mr. H. E. O. Wheeler, O.B.E., Assistant Superintendent of the Line; Mr. C. J. Latham, Eastern District Superintendent; Messrs. R. T. Richards and J. C. Dann, M.B.E., Assistants to the London District Traffic Superintendent; Mr. J. C. Taylor, of Messrs. McCorquodale, Ltd.; Mr. F. Browning, Office of the Superintendent of the Line; Mr. W. Martin, Chief Clerk to the London District Traffic Superintendent; Mr. E. Card, M.B.E., Station Superintendent, Cannon Street; Mr. W. F. Pullen, Chief Controller. The chairman spoke in praiseworthy terms of the abilities displayed by his staff throughout the year, and stated that he was quite confident that the same devotion to duty would continue to be given, which would contribute towards the success of the Southern Railway. The committee consisted of Miss E. Watt, Messrs. T. Houlton, F. Grayer and S. Isaac.

* * *

AMBULANCE work on the Great Western Railway receives considerable official encouragement. Classes are held at Paddington and elsewhere under the Great Western centre of the St. John Ambulance Association, the company bearing the cost. In 1919, the first complete year after the war, the number of certificates awarded by the Great Western Railway was 1,654, the next year it rose to 2,507; in 1921 it was 3,761; while in 1922 the number increased to 4,896.

* * *

A NEW Underground map of London has just been issued, prepared on a much larger scale than previous editions. It includes the new extension works now taking place on the Tube system. The map is much clearer than its predecessors, and the information on the back has been remodelled. It contains a mine of information, including the times of the last trains from theatreland. Over two millions of these maps are issued gratis to the public every year.

* * *

A BIG scheme is in hand for additional platform accommodation and the re-arrangement of the existing platforms at Golder's Green London Underground station. The reconstructed station will be provided with three platforms, two of which will be island platforms, with an additional track for southbound trains when the Hendon extension opens in October. Elaborate arrangements are being made for speeding up the traffic by the introduction of additional tracks to facilitate the coupling and uncoupling of trains for peak and slack hour working, so as to cause no interference with the running

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of through trains to Hendon, and eventually Edgware. The new scheme will enable a three-minute service of through trains to be run through the station whilst the coupling and uncoupling of trains is taking place. The new works, which are to be put in hand immediately, will cost £38,000. With the opening of the Hendon and Edgware extension, Golder's Green will become one of the busiest centres of outer London. When the Hampstead line was first opened in 1907, the number of cars worked in and out of Golder's Green station was 48 per hour. To-day 220 cars per hour are worked, and next October 300 per hour will be reached. When the Hendon and Edgware extension is fully working and the City and South London widening is completed, Golder's Green will have a capacity for handling 480 cars an hour. It is worthy of note that while in 1907 Golder's Green was a small country village with but a few cottages, last year 12,000,000 passengers used this station.

* * *

A NOVEL erector has been brought into use to aid speeding up with the reconstruction of the City and South London Railway. The machine is in service on the station sections of the tunnels, and lifts the huge 21-ft. steel segments into place to form a complete ring of tunnel. The erector weighs about 5 tons, and travels to and fro on special roof supports. It is operated by small engines driven by air pressure.

* * *

BY the London Electric Railways an order has been placed with Messrs. Mirrlees, Watson & Co. for a new 15,000 kilowatt turbo-generator. This will bring the generating equipment of the great power house at Lots Road up to eight turbo-generators of 6,000 kw., and three turbo-generators of 15,000 kw., making a total capacity of 93,000 k.w. for supplying power for the Underground Railways. Owing to the rapid progress which is being made with the new railway extensions, it has become essential to increase the reserve of power from the big distributing station at Chelsea.

* * *

PASSENGERS carried by London's Underground transport undertakings (tubes, and 'buses, and exclusive of tramways) for the year 1922, amounted to no fewer than 1,171,927,766. This represents an increase of 72,049,844 passengers over 1921. The number of car-miles run amounted to 163,401,602, being an increase of 7,555,618 miles over 1921. The number of car-miles run would be equivalent to a journey 6,561 times round the earth. In 1922, London's Underground ran in daily service, 1,480 passenger cars on its railways, and 2,800 omnibuses on the streets of London. No less than £1,334,000 was expended during 1922 in the provision of new rolling-stock, constructional improvements and extensions of the railways. The companies concerned are committed to an expenditure of £17,000,000 for widespread improvements in Greater London traffic facilities.

* * *

"CROCUS time at Kew," as the subject of a London Underground Electric Railway poster has turned the mind of many a tube traveller during the past month to thoughts of spring and the gentle joys of gardening. Other attractive posters issued from Electric Railway house during recent weeks direct attention to the National Gallery and to the Science Museum at South Kensington.

* * *

WRITING from Hove, on March 9, Mr. Gordon C. Hector communicates the following items concerning locomotives of the Brighton section of the Southern Railway. He states: 0-6-0 locomotive No. 540 has been entirely rebuilt early this year as "X," similar to the rebuilds of the class by Mr. Marsh. Contrary to the usual black colour for London, Brighton and South Coast goods engines, this locomotive is now painted brown with yellow lining, similar to the passenger locomotives. E2 0-6-0T, No. 106 quite recently has been painted in the same manner. 0-6-0, No. 555 has the dome on the last ring of the boiler, instead of on the usual second. Its safety valves are of the Billinton "column" type and are on the top of the firebox. Several of the early batch of 4-4-0 tanks, class T1, have a new type of funnel fitted, similar to the 0-6-2T type, only slightly shorter. Nos. 1, 2, 7 and 10 are so equipped. No. 351 has not yet been painted the standard colour, although she left the shops in January, 1921, and at the time of writing *Remembrance*, No. 333 is still red colour.

* * *

REPRINTED from the *Bulletin of the International Railway Congress Association*, there has just been published as a 20-page pamphlet, in paper covers, an illustrated epitome of "British Locomotives in 1922," by J. F. Gairns, M. Inst. Loco. E. The London agents for the publishers are Messrs. P. S. King & Son, 2, Great Smith Street, Westminster, S.W.1. The author deals at length with the six new British locomotive designs

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for 1922, particularly the Great Northern and the North Eastern "Pacific" type engines. In regard to the locomotive work in Great Britain during the year, the pamphlet, while it does not cover all the lines, and, in somes cases, the fastest schedules, indicates the general character of performance, usually with heavy loads, and often under conditions which render the work done far more notable than a mere record of average speeds and scheduled times would suggest.

* * *

On this page is illustrated Guinness & Co.'s 0-4-0 saddle tank locomotive No. 3, built by Hudswell, Clarke & Co., Limited, in 1918. The photograph was taken while the engine was engaged in shunting in the yard of the Great Southern and Western Railway, Kingsbridge, Dublin. The firm's engines run through the streets connecting the famous brewery with the railway premises. The shields round the driving wheels may be noted.

* * *

Sir W. G. Armstrong, Whitworth & Co., Limited, have secured orders for 37 heavy main line locomotives. Of these, 20 are for the Indian State Railways and 17 for the East Indian Railway. These locomotives are intended for goods traffic, and are of the 0-6-0 superheated type, with six-wheeled tenders, for a gauge of 5 ft. 6 in. They will be built at Newcastle-on-Tyne.

In addition to the 37 Indian locomotives referred to already, it is announced that Sir W. G. Armstrong, Whitworth & Co., Ltd., have received, through their Lisbon agents, an order for 12 locomotives of the 4-8-0 superheated type with double bogie tenders, for the Loanda State Railways of Angola, Portuguese West Africa.

* * *

The illustration of Rhymney Railway 2-4-0 saddle-tank passenger engine No. 7, on page 205, March Railway Magazine, was from a photograph which should have been acknowledged to Mr. R. E. Bleasdale, Warwick.

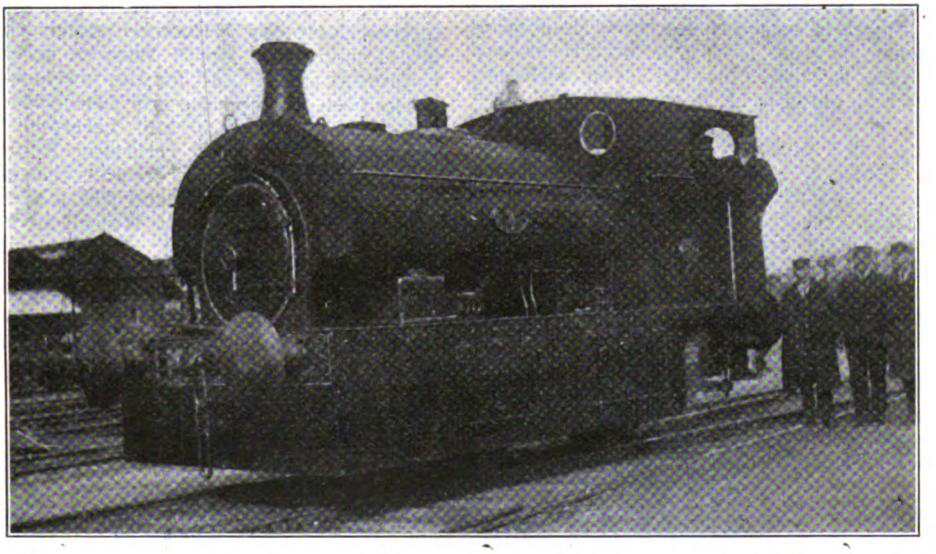

Photo.] AN IRISH INDUSTRIAL LOCOMOTIVE. [*J. Macartney Robbins.*

Messrs. Guinness & Co.'s 0-4-0 saddle tank, No. 3.

Writing from Crewe, Mr. C. Williams reports:—The first five 0-8-4 side tank shunting engines will shortly be turned out at Crewe, as follows: Nos. 380, 782, 1189, 1677 and 1976. These engines have "G.2" class boilers, and cylinders 20½ in. by 26 in. Five others to complete the batch are expected out in due course. Some further engines of the four-cylinder "Claughton" class are being named, including No. 169, which is now *Breadalbane*; No. 30, *Thalaba*—a combination very near to that of the old No. 36, *Thalaba*—and No. 180, *Llewellyn*. The following "Precursor" class locomotives are being converted to "George the Fifth" class: Nos. 127, *Snake*; 1116, *Pandora*; 412, *Marquis*; and 1311 *Napoleon*.

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INTEREST in railway history has been increased rather than diminished by the recent great grouping operations. Pertinent proof of this circumstance was the keenness of the audience at Fillebrook Lecture Hall, Leytonstone, on March 5, when a lecture, illustrated by lantern slides, was given by Mr. J. F. Gairns, his subject being "The Passing of the Great Eastern Railway." Several chief and other officers of the railway in question were present, but most of the large attendance were members of the general public, and Mr. Gairns successfully gripped their close attention from the start to the finish. The lecturer dealt with historic aspects of the Great Eastern Railway, especially matters affecting the London suburban area, and, as indicating the great changes of recent years, he emphasized the growth of season-ticket travel, indicating in some measure how it is that trains are crowded at busy periods, even although there may actually be, in the aggregate, more seats provided than passengers to occupy them. In connection with the views exhibited, touching upon all sections of Great Eastern activity, and covering trains, locomotives, Stratford Works, Continental steamers and traffic, "conductor-guards," single-line working, "halts," facilities, holiday attractions, &c., many interesting points were brought out. Reference was made to social activities of various kinds on the Great Eastern Railway, and the lecture concluded with some remarks regarding the London and North Eastern Railway, future prospects, and the probabilities of electrification of suburban lines.

* * *

A TON-MILE, the measure of transportation, is one ton moved one mile. From midnight to midnight the London Underground lines haul 5,500,000 ton-miles of trains and passengers. These 5,500,000 ton-miles are equivalent to moving an Underground railway car a distance greater than from the earth to the moon and back, or by moving 220 tons (a train of 10 cars loaded with passengers) around the world.

* * *

FOR the Crystal Palace grand sacred concerts on Good Friday, and special holiday entertainments on Easter Monday, cheap return tickets, 2s., including admission, will be issued from certain London stations of the Southern Railway. A fast service of electric trains will be run as required by the traffic. A programme of the whole of the Easter arrangements of the London, Brighton & South Coast section of the Southern Railway, embracing Continental, seaside and country trips, may be obtained from the Superintendent of the Line (B), Southern Railway, London Bridge, S.E.1.

* * *

BEGINNING March 15 the London-Boulogne excursions were established by the Southern Railway for the 1923 season. The trips operate daily, including Sundays, and the third-class fare (return) is 23*s.* 6*d.*, as compared with 29*s.* 6*d.* last year. The passenger leaves Victoria (S.E. & C.) at 9.15 a.m. and arrives back at 10.40 p.m., having had over six hours in France. No passports are required.

* * *

WRITING from Cudworth on March 1, Mr. W. T. Thornewell remarks that it may interest RAILWAY MAGAZINE readers that a late London and North Western six-coach restaurant car set had for the previous four weeks been working the late Lancashire and Yorkshire train, 10.20 a.m. Liverpool (Exchange) to Newcastle, returning from the latter place at 4.50 p.m. He adds that about two years ago a London and North Western dining-car train ran from Walsall to Bradford *via* the Midland line. Further, on the occasion of a semi-final for the English Cup last season at Sheffield between Preston and Tottenham, a special ran from Preston to Sheffield running over the Midland line from Thornhill Junction to Sheffield. The train was composed of both London & North Western and Lancashire & Yorkshire stock. Mr. Thornewell also mentions that early in February a special was run to Blackpool Central from Sheffield *via* Thornhill Junction, the Midland engine and coaches working through in charge of a pilot driver over the Lancashire and Yorkshire line.

* * *

MESSRS. BASSETT-LOWKE, LTD., Northampton—of model locomotive fame—will in April bring out a new "Ships' List," which will contain many new and notable lines, also a considerable reduction in the price of most of the firm's standard articles. The price of the list, post free, will be 1*s.*

* * *

THE Minister of Transport has made the following Order:—The Totton Hythe and Fawley Light Railway (Amendment and Transfer) Order, 1923, authorising the construction of new light railways in extension and deviation of the light railway authorised by the Totton Hythe and Fawley Light Railway Order, 1921, and the abandonment of parts of the said light railway and the transfer to the Southern Railway Company

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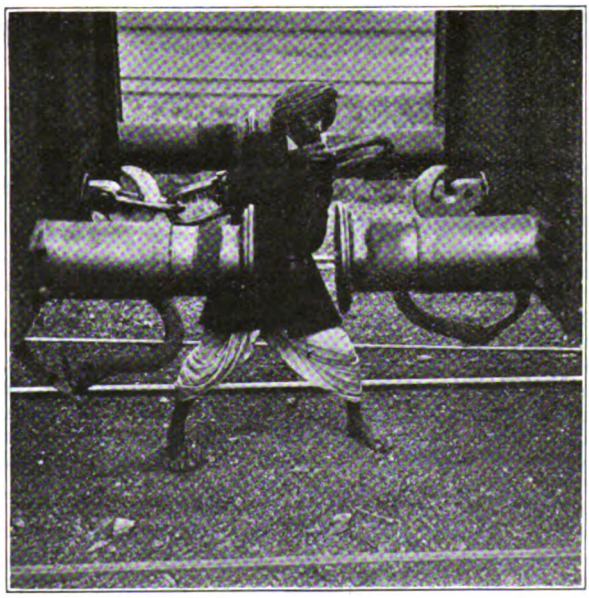
of the undertaking of the Totton Hythe and Fawley Light Railway Company, and for other purposes.

* * *

CERTIFICATES and medals won by the members of the Highland Railway Ambulance Class were presented recently in the Board room, Inverness Railway Station, by Mr. Robert Park, late General Manager. Expressing gratification that so much interest was taken in ambulance matters by railwaymen, particularly the younger ones, Mr. Park said he regarded the ambulance class as one of the best institutions for the good of young men in the employment of the railway, and he had noted that many who had taken an interest in ambulance now occupied responsible positions in the railway service. As his time with the Highland Railway was drawing to a close, he offered a little memento in the form of a cup, to be awarded to the best individual competitor in oral and practical ambulance work, the cup to be competed for annually under conditions which were then set forth. He then presented the various prizes, including General Manager's medals, 1st year certificates, and 2nd year medallions. The Director's Challenge Cup would continue to be competed for by teams throughout the system. Mr. D. Brebner, of the traffic section, and Mr. Scott, of the locomotive section, thanked Mr. Park and other officials for their appreciation and assistance, while Mr. Bowman, Class Secretary, explained that the class desired to present Dr. Macfadyen, junior, with a case of surgical instruments. Mr. A Newlands, in moving a vote of thanks to Mr. Park, remarked that it was due to Mr Park that ambulance had made so much progress on the Highland Railway.

* * *

As we go to press we learn that exceptional interest is being taken in the Bohemian Concert that is to be held at the Queen's Hall, Langham Place, London, W., on Saturday evening, March 24, under the auspices of the Great Eastern Railway Musical Society. The chairman will be Sir Hugh Bell, Bart., C.B., and the hon. conductor Col. W. Johnson Galloway. In addition to the soloists, Miss Agnes Nicholls and Mr. Robert Radford, there will be present the Society's full orchestra of 100, and massed male voice choirs of 230 from London, Cambridge, Ipswich and Norwich, assisted by contingents from the Great Northern and Great Central sections of the London and North Eastern Railway.



A SHUNTER ON THE GREAT INDIAN PENINSULA RAILWAY.

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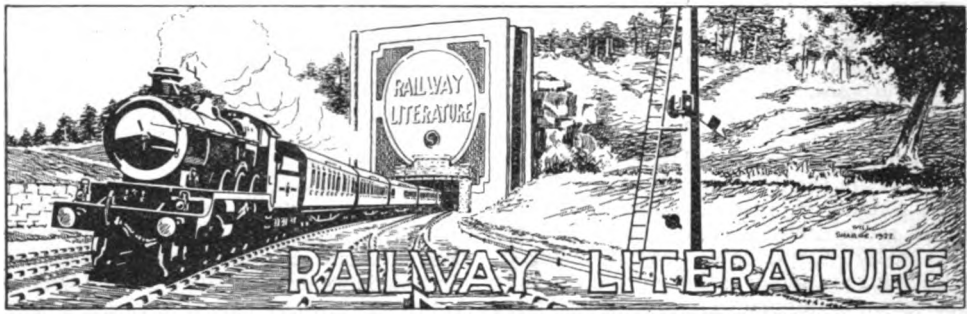

BULLETIN NO. 4. THE RAILWAY AND LOCOMOTIVE HISTORICAL SOCIETY.

This addition to the series of Bulletins of the Society, like its predecessors, includes a number of interesting articles, especially in regard to historical aspects, though naturally their application is mainly, if not exclusively, to American railways. Among articles in Bulletin No. 4 may be mentioned those entitled Boston Old Depôts, Recollections of the Boston and Maine Railway, the Mount Washington Railroad, Famous "Colour" Trains of America, and the First Iron Passenger Cars (built in 1859 for the Boston and Worcester Railroad). Items of interest to the Society are also included, while an addendum gives particulars of locomotives employed on United States railways during the Civil War. We are advised that Mr. G. W. Bishop, of 57, Warwick Road, Kenilworth, is prepared to supply information in regard to the Society to British readers.

NICKEL. By F. B. Howard White, B.A. [Sir Isaac Pitman and Sons, Limited, Parker Street, Kingsway, London, W.C.2. Price 3s. net.]

In this cloth-bound, illustrated book of 118 pages, the author deals with the mining, refining and application of nickel. In regard to coinage, he claims advantages of pure nickel over copper and bronze money. As to malleable nickel, the widespread use of three-electrode ionic valves has demanded the production of particularly pure malleable nickel for these instruments. The present wireless broad-casting boom will cause a large increase in the number of amplifier valves manufactured. The use of nickel steel for long span bridge construction is of great interest to engineers. The author points out that Quebec Bridge weighs upwards of 60,000 tons, of which a very large proportion is 3½ per cent. nickel steel. Mr. Howard White among other uses of nickel directs attention to the superiority of pure nickel over aluminium and other metals for cooking utensils, and gives an illustration of a modern railway restaurant car kitchen furnished with pure nickel utensils.

OIL POWER. By Sidney North. [Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C. 2. Price 3s. net.]

This useful volume, added to Pitman's "Common Commodities and Industries" series of handbooks, has been compiled by the editor of *Oil Engineering and Finance* and the *Petroleum Year Book*, "in view of the great expansion which has occurred in the adoption of oil for power production during the last few years and the considerable interest necessarily taken therein." Obviously, in the course of 122 pages, and with the aid of 22 illustrations, it is impossible to go deeply into technical detail. The subject is, however, covered sufficiently to meet the needs of the uninitiated and to assist the experienced user for general purposes. Earlier chapters deal with general aspects of the subject and with the home production of fuel oils. Three chapters then deal, respectively, with direct oil firing, oil fuel on ships, and oil fuel on railways, though in the last case experience abroad is largely quoted, only limited reference being available to British experience. Further chapters deal with the internal combustion engine, the motor ship, oils for power purposes, oil for power and heating in industry, oil storage and the distribution of oil. A number of useful tables are distributed throughout the volume, also in the appendix.

Messrs. Leyland Motors, Limited, of Leyland, Lancashire, send a specimen of the Leyland Hydro Calculator. This is an ingenious novelty incorporating the dual features of calculator and model of the Rees Roturbo Pump fitted to all Leyland fire engines. As a means of obtaining comparative results this little device offers a quick and easy method without referring to complicated formulæ. Instructions are printed on the containing envelope, which are entirely self-explanatory. Complimentary copies of these calculators are being distributed to fire brigades for their own use.

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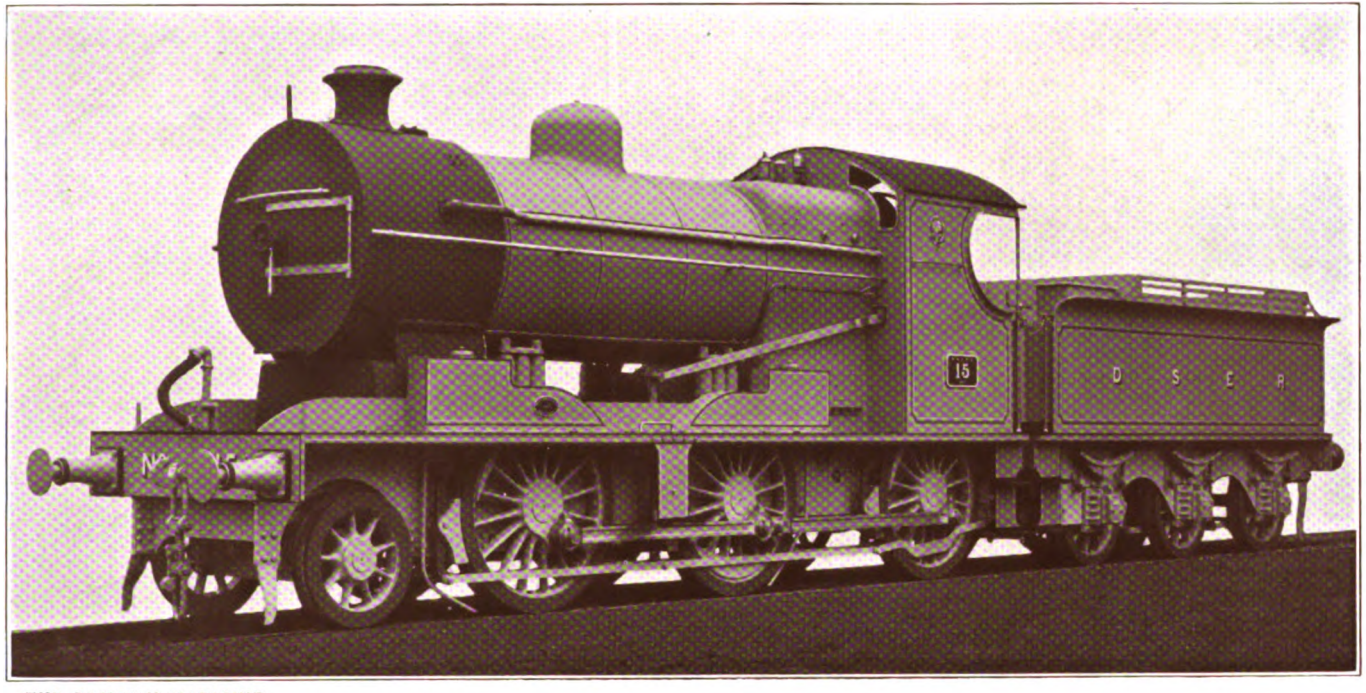

THE RAILWAY MAGAZINE.

2-6-0 SUPERHEATED GOODS LOCOMOTIVE, DUBLIN AND SOUTH EASTERN RAILWAY.

MR. G. H. WILD, Locomotive Engineer.

Cylinders, 19 in. by 26 in.; Coupled Wheels, 5 ft. 1 in. diam.; Leading Wheels, 3 ft. diam.
Heating Surface—Tubes, 952 sq. ft.; Firebox, 134 sq. ft; Superheater, 162 sq. ft.; Total, 1248 sq. ft.
Grate Area, 20 sq. ft. Steam Pressure, 175 lbs. per sq. in.
Weight in Working Order:—Engine, 48½ tons; Engine and Tender, 81 tons.

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CORBIÈRE TRAIN LEAVING ST. HELIER, JERSEY RAILWAYS AND TRAMWAYS.
2-4-0 Locomotive No. 1.

The Railways of Jersey.

By H. L. HOPWOOD.

(Photographs by the Author.)

JERSEY, the largest and most important of the Channel Islands, is a self-governed State which adopts French as the official language. It has its own laws and its own copper coinage. The area of the island is about 45 square miles, but the extreme length is 11 miles from south-east to north-west and 7 miles from north to south. The resident population is some 52,000 (of whom more than half live in St. Helier), but this figure is more than doubled during the tourist season. St. Helier, the capital, is an important and prosperous town on the south coast, and with its spacious harbour, fine buildings, and good shops, wears an air of affluence. The Island's principal exports are potatoes and tomatoes, but little, if any, of this traffic is handled by the railways.

There are two railways, both of which start at St. Helier and run along the coast—the Jersey Railways and Tramways going west to Corbière, and the Jersey Eastern Railway, east and north to Gorey Pier. The older and larger of the two is the Jersey Railways and Tramways, which was first opened in 1870. This line was originally called the Jersey Railways, Limited, being incorporated under the Companies' Acts, 1862 to 1880, and constructed under powers granted by special Acts of the States of Jersey. In January, 1896, the property was taken over by a new company—the Jersey Railways and Tramways, Limited.

(1) Jersey Railways and Tramways, Ltd.

The original line, constructed to standard gauge, extended only as far as St. Aubin, the ancient capital of the Island, and for the entire distance of 3½ miles ran close to the sea. The formal date of opening was October 25, 1870, but trial trips had previously taken place on September 28 and 29. The terminal stations were originally built with single-span roofs, having timber girders, but St. Helier station was rebuilt in its present form in 1901, and St. Aubin in 1922.

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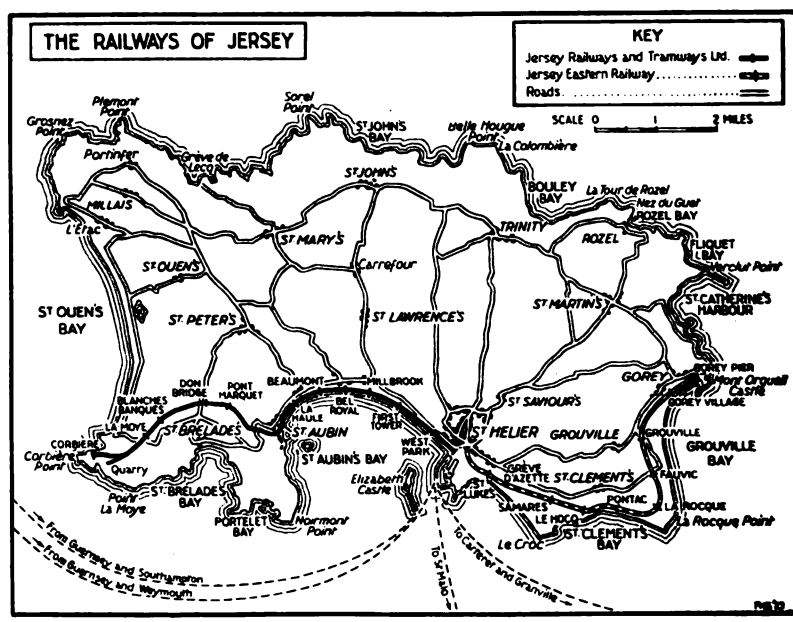
MR. W. N. POINGDESTRE.

Secretary and Manager,
Jersey Railways and Tramways.

This early line existed for 15 years, but on September, 1, 1884, a 4½ miles' extension from St. Aubin to Corbière was opened. This section was built to a gauge of 3 ft. 6 in., and at the same time the St. Helier–St. Aubin portion was similarly narrowed from 4 ft. 8½ in. gauge. The Corbière extension diverged from the old line a few yards east of St. Aubin station; consequently it was necessary to construct an additional platform on the seaward side of the old terminus. The line here is on a sharp curve and then crosses, on the level, the road in front of the terminus. It next passes through a short tunnel and goes inland for a few miles until the coast is again reached at Corbière. Thus, as it exists to-day, the railway dates from September 1, 1884.

In the eight miles which separate St. Helier from Corbière, there are no fewer than 13 stations, including termini. The line is single, with crossing places at Millbrook and Don Bridge. It is also possible for two trains to pass each other at St. Aubin, if one goes into the terminus. At St. Helier, the station is under cover of a two-span glazed roof; the accommodation consisting of an island platform, two running roads and two sidings. On one side of the station a traversing table connects two of the tracks. St. Aubin station was being remodelled at the time of our last visit, and when completed, the terminal portion will comprise two platforms—one an island—and three roads. In addition to this, there is the single platform, outside the main building, which serves the trains to and from Corbière.



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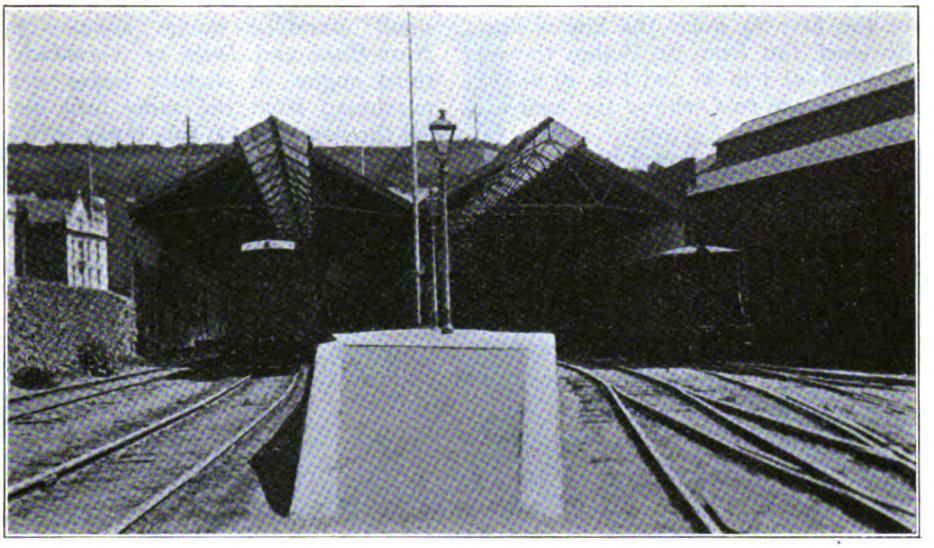

WEIGHBRIDGE STATION, ST. HELIER, JERSEY RAILWAYS AND TRAMWAYS.

Millbrook, a crossing place, has up and down platforms, but elsewhere, all stations are of the single-platform type. This statement also applies to Don Bridge, although that station is provided with a passing loop. Corbière station, on account of its situation on high ground and where it is exposed to the fierce south-westerly gales, is solidly built of granite.

When the line was extended to Corbière in 1884, a short branch was made to link up with the granite quarries near that place. It is stated that the quarry company entered into a contract to send over the railway a minimum of 75,000 tons of granite per annum for three years from the date of opening, or to pay a penalty of £2,000 per annum. The railway company owns 21 wagons, chiefly engaged in the granite traffic, but it is doubtful whether anything like the quantity stated above is conveyed at the present day.

GOREY PIER STATION, JERSEY EASTERN RAILWAY.

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For the first 3½ miles the line is practically level, but from St. Aubin there is a long climb at 1 in 36 and 1 in 40 to Don Bridge; thence to Corbière the course is an undulating one.

The control of the Board of Trade and of its successor, the Ministry of Transport, not extending to Jersey, such refinements as interlocking, signals (in the usual sense), and continuous brakes do not exist on the railways. All points are manually worked from ground levers and the only signals—of disc type—are those which work in conjunction with the level crossing gates.

small standard-gauge engines named *Haro-Haro* and *Duke of Normandy*. A third engine of slightly larger size was purchased from the same firm in 1872. All three were 2-4-0 side tanks with inside cylinders and 4-ft. coupled wheels. At the present time the company owns five engines, the earliest of which date back to 1884—the year in which the gauge was converted. They are all of the 2-4-0 side tank type, with outside cylinders, outside frames to the coupled wheels and leading pony trucks.

Leading particulars are as follows :—

Nos. and Names.	1. *St. Helier.* 2. *St. Aubin.*	3. *Corbière.* 4. *St. Brelades.*	5. *La Moye.*
Makers	Manning, Wardle	W. G. Bagnall	A. Barclay, Sons & Co.
Works Nos.	916, 917	1418, 1466	1105
Date	1884	1892, 1893	1907
Cylinders	13⅜ × 18 in.	13⅜ × 20 in.	15½ × 20 in.
Coupled wheels	3 ft. 6 in.	3 ft. 6 in.	3 ft. 6 in.
Total wheelbase	13 ft.	13 ft.	13 ft. 6 in.
Heating surface	635 sq. ft.	635 sq. ft.	792 sq. ft.
Working pressure	140 lbs.	140 lbs.	185 lbs.
Grate area	9 sq. ft.	9 sq. ft.	12·1 sq. ft.
Total weight	26 tons	26 tons	36½ tons.

The engines are equipped with steam brakes and the guards' vans with hand brakes.

For the opening of the line in 1870, Sharp, Stewart and Co. supplied two

From this list it will be seen that the five engines are divided into three different classes. Nos. 1 to 4 differ only in a few minor details, but in the case of No. 5, Walschaert valve gear has been adopted

SNOW HILL STATION, ST. HELIER, JERSEY EASTERN RAILWAY.

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0-4-2 LOCOMOTIVE "CARTERET," JERSEY EASTERN RAILWAY.

in place of Stephenson link motion, and this engine is altogether larger than the others. The engines are painted olive green, picked out with black bands and yellow and vermilion lines.

There are 23 passenger train vehicles, which, with few exceptions, are carried on four-wheeled bogies. Some are of the ordinary compartment type, but others are like tramway cars, having end doors opening on to a platform. Some of the old stock which is still running is mounted on four wheels. This is of two types—one a guard's brake, and one having two compartments for passengers and one for the guard. The earlier vehicles were supplied by private firms and are painted either dark red or green ; those of recent date have been constructed in the company's shops at St. Helier and are finished externally in plain varnished teak. On both of the railways there are only two classes—first and second—and all brake vans are equipped with letter boxes.

The summer service consists of 17 trains on week-days and 14 on Sundays, in either direction. Of these, eight and five respectively go through to Corbière ; the remainder run between St. Helier and St. Aubin and use the old terminal station at the latter town. Some of the Corbière trains run non-stop between West Park and St. Aubin. The time occupied in running the eight miles between St. Helier and Corbière is from 30 to 35 minutes.

The Jersey Railways and Tramways are shortly introducing a new type of rail motor car. This is a new self-contained vehicle, under construction by the well-known firms of the Sentinel Steam Wagon Co., of Shrewsbury, and Cammell Laird & Co., of Nottingham. The pioneer car is due to arrive in the Island during this month. It will provide first and second class accommodation for 60 passengers. For a time it will be used to supplement the usual train arrangements to complete an half-hourly service. The car will stop at intervals, and is expected to be very economical in coal, running about 120 miles per 5 cwt.

In concluding this section it may be mentioned that the Company is in a sound financial condition, and paying 6 per cent. Its chairman is the Rt. Hon. Edward Cecil Moore, Lord Mayor of London.

(2) Jersey Eastern Railway.

This railway was incorporated in March, 1872, and opened 18 months later. It starts at Snow Hill station, St. Helier, runs in an easterly direction to La Rocque and then turns north to terminate at Gorey Pier. For the entire distance of $6\frac{3}{8}$ miles the track keeps very near to the coast. Built to the standard gauge of 4 ft. $8\frac{1}{2}$ in., the line was first opened to Grouville on August 7, 1873, and then to Gorey Village on August 27 of the

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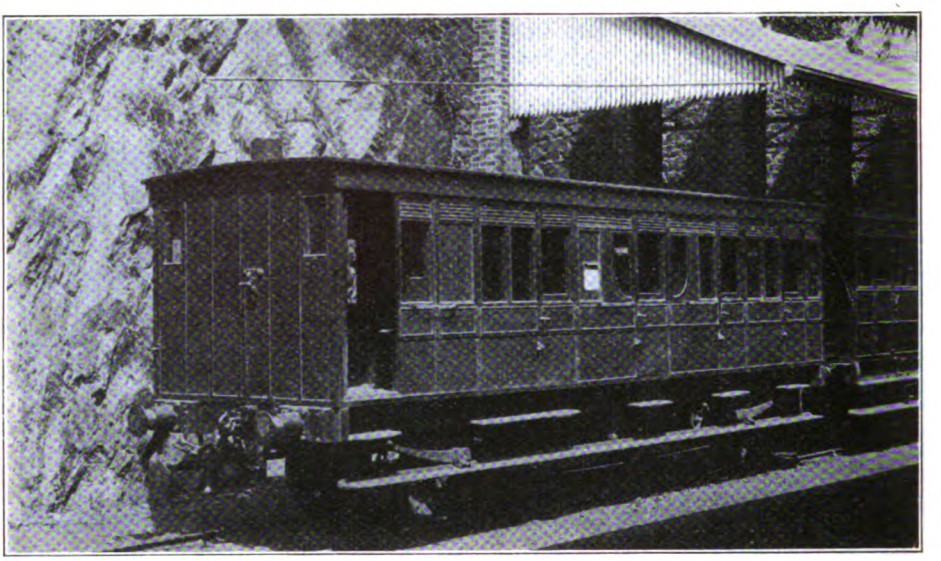

OLD BRAKE COMPOSITE CARRIAGE, JERSEY EASTERN RAILWAY.

same year. The completion of Snow Hill station, St. Helier, followed on May 6, 1874. For nearly 18 years Gorey Village remained the eastern terminus, but on May 25, 1891, a half-mile extension was opened to Gorey Pier station, at the base of Mont Orgueil Castle.

The line is single and is laid with flat-bottomed rails weighing 70 lb. to the yard. Stations, like those on the adjoining line, are very numerous, there being 11 altogether in the run of 6⅜ miles. Loops for crossing trains exist at Pontac and Grouville, and these stations have up and down platforms, but at other places, including termini, there is only one platform. Substantial two-storey buildings, which incorporate the stationmaster's residence, are the rule, but no platform shelters are provided, except at the St. Helier terminus.

Snow Hill station is remarkable for its picturesque location. Although situated within the town of St. Helier, it lies in a very deep cutting below Fort Regent. Excavating through the rock proved a costly and difficult undertaking, for the cutting extends a distance of a quarter of a mile and its sides are nearly perpendicular; rising at some places to 100 ft.

A very curious old signal is to be seen at Snow Hill station. The semaphore works in a slotted post, and at one end is pierced for a red glass. The light for the latter is provided by a lamp which, at one portion of its career has obviously done duty on a street lamp post. A very large wooden ladder completes the equipment. The apparatus controls trains in either direction. Elsewhere, there are other signals, of the disc pattern, which work in connection with the level crossing gates. These gates, it may be remarked, are of Continental pattern, *i.e.*, they rise to a vertical position when the roadway is clear.

The locomotive stock comprises four engines, all of which were built by Kitson and Company, of Leeds—*Caesarea* and *Calvados* in 1872; *Mont Orgueil* in 1886, and *Carteret* in 1898 (works numbers 1832, 1833, 2972 and 3800 respectively). They are of one type, viz., 0-4-2 side tanks, having cylinders 13 in. by 20 in. and coupled wheels 4 ft. in diameter. *Mont Orgueil* differs from the others in having outside frames to the trailing wheels. The boiler provides a total heating surface of 505 sq. ft. and works at a pressure of 140 lb. In running order the total weight is 25 tons. From the illustration of *Carteret* it will be noticed that a circular sand-box is mounted on top of the boiler. These very neat-looking engines are painted a bright green with black bands and white lines.

The passenger carriages, 15 in number, are all four-wheeled. The external panelling

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is of natural teak, varnished. One of the older carriages—a composite brake—is shown in an accompanying illustration. The old-time three-cornered windows in the first-class compartment will be observed; also the almost flat roof, and the safety latches below the door handles, this being a feature common to all vehicles. Five of the original coaches were second-hand vehicles purchased from the London and North Western Railway. Some of these dated back to 1850, but all were withdrawn from traffic 10 years ago. The body of one is still to be observed in a field near St. Luke's station. The coaches are distinguished by letters instead of the usual numbers.

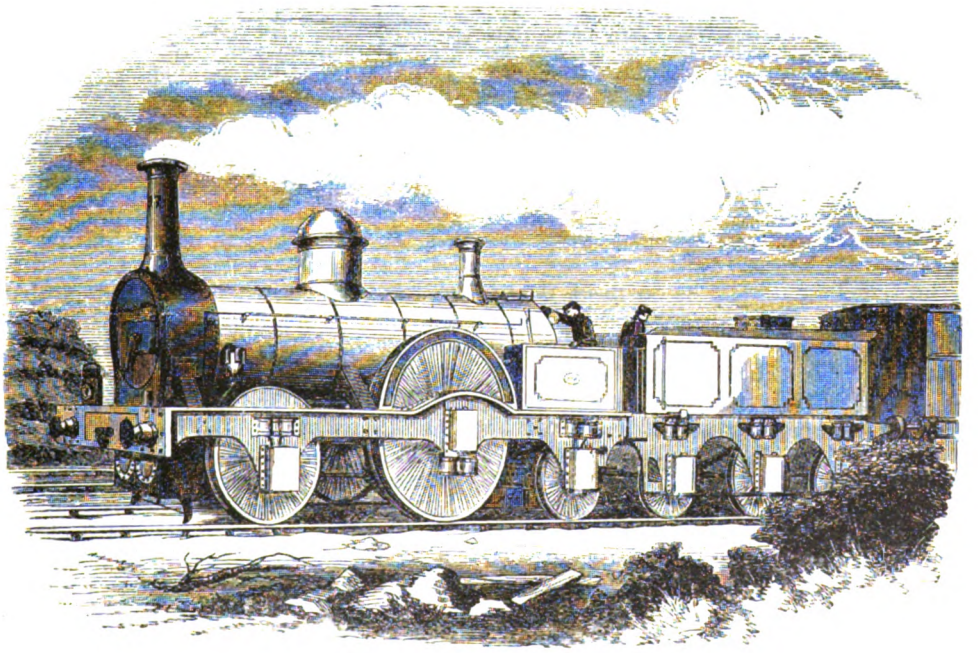
There are 13 trains each way between St. Helier and Gorey Pier on week-days, with an extra late trip out and home on three evenings of the week. On Sundays there are nine trains each way. Most of them leave St. Helier at the even hour and return from Gorey Pier at the half-hour. The time taken on the journey is 24 min., with nine intermediate stops.

Since the war, the loops at Pontac and Grouville have been disused and one engine and train now works the whole of the service. The same engine is at work from 8 a.m. to 10.25 p.m., and during that time runs a minimum mileage of 169 miles. On three days of the week it runs 182 miles and does not finish until 11.30 p.m. It is actually running for the greater part of the time it is in steam, as, in the case of most trains, only six minutes are available for running-round purposes at the termini.

Excursion tickets, at about 75 per cent. of ordinary fares, are issued on Thursday afternoons and Sundays to Corbière (for the Lighthouse) and Gorey Pier (for Mont Orgueil Castle) by the respective railways.

Nine hours constitute a day's work for railwaymen in Jersey. It is hardly necessary to mention that the two railways are unaffected by the Railways Act of 1921.

A "FLYER" OF EARLY DAYS.



McCONNELL PATENT ENGINE OF SEVENTY YEARS AGO.

From an old Wood-cut.

(See "Pertinent Paragraphs" for particulars.)

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Locomotive and Train Working in the latter part of the 19th Century.

THE BARRY RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Barry Railway was, except for the Port Talbot Railway, the last independent railway company of the 19th century. When I first made its acquaintance in 1887 it was in the making, and consisted of unfinished earthworks, cuttings, and tunnels, on and through which an army of contractors' locomotives were busily at work. A companion in my wanderings of those days remarked: "This is going to be *the* South Wales railway of the future." He was not far out in his prophecy, for the commercial progress of the line was wonderful. It was opened for traffic at the end of 1888 with about 10 engines, and by the end of the century, within 12 years, the locomotive stock numbered 126.

The original title of the line was "The Barry Dock and Railway Company," but rather than trail this title about through life amongst its impedimenta, it decided to get Parliament to sanction the much shorter and more convenient name of "The Barry Railway," after it had been in existence about seven years from the passing of the original Act in 1884.

But of course it was the docks at Barry which made the railway, for without the docks the latter would have been pointless. The subject of my article does not, however, include the working of docks, and it is not my intention to deal with these. An illustrated account of them was given in the RAILWAY MAGAZINE of October, 1906, to which those readers interested can refer. A very fully illustrated account of the docks is also to be found in a book published by the company entitled "Barry Docks, the South Wales port."

The railway is a mmeral line, and owes its origin to the colliery owners of the Aberdare and Rhondda valleys of South Wales, who were dependent for their export trade upon the port and docks of Cardiff and Penarth. The Taff Vale Railway did its best for them, and also earned big dividends for itself, but the dock accommodation at the ports was insufficient. The congestion was great and ships could not enter, with the result that coal was held up in the colliery company's wagons for days and even weeks. South Wales coal for shipment is carried in the colliery wagons, and the railway companies do their share by providing enormous sidings for their accommodation. But the collieries wanted their wagons back at the pits for reloading, and having in most cases very limited siding accommodation of their own, had frequently to stop work for want of wagons. Some of the large colliery owners and traders therefore decided to take the bold step of raising the capital for a new large port at Barry, seven to eight miles west of Cardiff. Barry had no railway, though a connection with the Penarth branch of the Taff Vale was possible. This connection from Barry to Cogan, near Penarth Dock Station, five miles in length, was made and formed part of the original scheme, though probably the underlying intent in making this branch was to provide a connection for passengers between Barry and Cardiff.

But though the coal traffic from the coalfield to Barry could have been brought as far as Cogan via the Taff Vale, the promoters of the Barry scheme foresaw that railway congestion would take the place of dock congestion, and decided to have their own independent line. This forms the main line of the Barry Railway, and leaves the Barry–Cogan line at Cadoxton, two miles east of Barry and one mile east of Barry Docks station, whence it strikes in a northerly direction through various places with unpronounceable Welsh names to Trehafod Junction

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where it joins the Taff Vale Rhondda branch between Pontypridd and Treherbert.

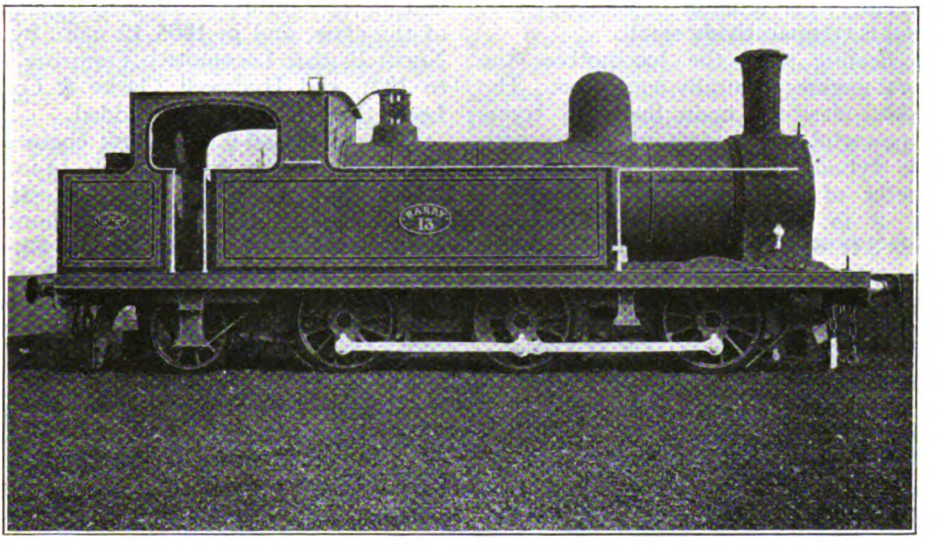
The main line ends at Trehafod, the distance from Barry being slightly over 18¾ miles. Coal trains for Barry from the collieries north-west of this point are worked by the Taff Vale Railway and handed over to the Barry Railway at the junction, but the latter company has running powers for passenger trains over the Taff Vale as far as Porth station, a distance of 1 mile 54 chains from the junction.

At Tonteg Junction, about 14½ miles from Barry, a mineral branch, 1¾ miles long, leaves the main line on the east side and connects with the Taff Vale main line at Treforest Junction. Coal traffic from the Aberdare and Merthyr districts comes down the Taff Vale to Treforest Junction, and such as is intended for shipment at Barry Docks is there handed over to the Barry Railway.

On the west side of Barry main station there is a branch 1¼ miles long which goes round to Barry Island. This is used mainly by passenger trains and terminates at the steamer pontoon situated to the west of the entrance to Barry Docks.

The main line to the north crosses the Great Western South Wales main line near St. Fagans, and there are connecting loops from the Barry Railway both from the north and south. The loop from the north leaves the Barry line at Tyn-y-Caeau Junction and joins the Great Western at St. Fagans in the eastward direction of Cardiff. This line is used principally for the passenger train service worked by the Barry Railway between Pontypridd and Cardiff.

The gentleman who fixed on a place for a railway junction with a name like Tyn-, &c. (as above) ought to have been promptly deported. I have just had three shots at coupling up the vowels in proper order, each one with a worse result than the others. Consequently, for the future, as far as this article is concerned, it is going to be called T.C.



0-6-2 MINERAL TANK ENGINE, No. 13.
Coupled Wheels, 4 ft. 3 in. diam. Cylinders, 18 in. by 26 in.

The loop from the south leaves the Barry at Drope and joins the Great Western at Peterston on the west side. It is used for goods traffic from Barry to all Great Western stations, and enables the Barry Railway to avoid using the Taff Vale section between Cogan Junction and Cardiff.

The gradients on the main line are generally in favour of the loaded trains coming from the north. Leaving Trehafod there is a very slight rise for about 6¾ miles, which is followed by a 4½-mile fall

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of 1 in 120 to T.C. Junction. From T.C. there is a rise of 1 in 400 for about 3½ miles to beyond Wenvoe. This stretch passes through the Wenvoe tunnel, which is more than one mile long. After half-a-mile of level there follows a fall of about two miles at 1 in 127 to Cadoxton, which brings the line down to the level of Barry. On the Barry island branch there is a short section of 1 in 80 falling towards Barry Pier.

The quantity of coal carried by the Barry Railway was enormous. Although not within the strict limits of these articles, I may add that in 1913, the company's record year, over 11 million tons were conveyed over the railway to the dock for shipment. The amount of general goods carried is comparatively small.

In dealing with the locomotives the mineral engines naturally come first. The standard class for main line coal trains is a powerful 0-6-2 side tank engine with inside cylinders 18 in. by 26 in. The diameter of the six-coupled wheels is 4 ft. 3 in. and of the radial trailing wheels 3 ft. 6 in. The boilers, as originally built, were interchangeable, but differed in that some of the engines had 2-in. tubes, and the later ones 1⅞-in. tubes. The total heating surface of the former engines was 1,133 sq. ft. and that of the latter 1,070 sq. ft. The grates have an area of 20½ sq. ft. The pressure is 150 lb., and the engines weigh 56½ to 57 tons in working order, of which 46¼ tons are carried on the coupled wheels. The tanks are of large capacity and contain 1,750 gallons of water.

The first lot of the above engines were built in 1888 by Sharp, Stewart & Company, and down to the end of 1900, when the last engine of the class was built, there were 67 in all. Those built by Sharp, Stewart were Nos. 6 to 10 (1888), 11 to 19 (1889), 23 to 32 (1889-90), 38 to 46 (1890) 73 to 78 (1894), and 105 to 116 (1900). In addition, Nos. 54 to 63 were built by the Vulcan Foundry, Limited in 1892, and five, Nos. 122 to 126, were constructed in 1899 by the Franco-Belge Company of La Croyère, Belgium.

For short-distance trains, but principally for shunting the heavy coal trains at the coal tip sidings and docks, heavy 0-6-0 saddle-tank engines are employed. These also form a standard class with cylinders 18 in. by 26 in. and 4 ft. 3 in. coupled wheels. The cylinders, motion, and boilers are interchangeable with those of the preceding 0-6-2 tank engines. The saddle-tank extends from the front of the smoke-box to the back end of the boiler barrel, but does not cover the firebox casing. Its capacity is 1,050 gallons, and the coal bunker holds 1½ tons of coal. The engines weigh 49½ tons in working order. This class also dates from the opening of the line and was built as follows:—Nos. 1 to 5 (1888),* 47 to 49 (1890), 70 to 72 (1894), 37 and 52 (1899) and 99 to 104 (1890), all by Sharp, Stewart & Company, and in addition, Nos. 64 and 65 were constructed by the Vulcan Foundry in 1892. By the end of the century there were 21 engines of the class, and in 1905 12 more by the North British Locomotive Company (127 to 132), and Hudswell, Clarke & Co., of Leeds (Nos. 133–138) were added.

Five small 0-6-0 side tank engines by Hudswell, Clarke & Co., with 14-in. by 20-in. inside cylinders, and 3 ft. 3½ in. coupled wheels are used for light shunting. These are Nos. 33, 34, 50, 51 and 53, and were delivered in 1889–1891. They are very useful little engines, as they are able to go round some of the dock sidings with sharp curves, and into places which no other engines can attempt. They are chiefly used for conveying stores and coal to the various hydraulic power houses.

The loads taken by the main-line 0-6-2 tank engines between Barry and Trehafod were for the down trains to Barry, 50 10-tou loaded wagons, about 800 tons gross, and for the up trains 50 similar empty wagons weighing about 300 tons. If the wagons were loaded with pit props for the collieries, a corresponding reduction in the load was made.

There was however another type of mineral engine on the line, a sort of accidental class of four 0-8-0 tender engines which dropped on to the Barry from "No-man's land." They are the only tender engines on the line, and deserve special mention for the reason that they were the first eight-wheels coupled tender engines to be used on a British railway. Naturally they had a history. In 1886–8, Sharp, Stewart and Co (then of Manchester) contracted to build several 0-8-0 engines

* Nos. 1 to 5 differ from the others and have side tanks.

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for a railway connecting Sweden and Norway within hail of the Arctic circle. This "Furthest North" railway proved very expensive to make; the company ran out of funds and came to grief before the line was completed, as a result of which the locomotive builders found themselves with a number of large freight locomotives on their hands. Two of the engines, built in 1888, were purchased by the Barry Railway about a year afterwards, and became Nos. 35 and 36 on that line, and subsequently, in 1897, two more, which had been constructed in 1886-7, were taken over by the Barry Railway, by whom they were numbered 92 and 93. The remainder of the engines were sold by the manufacturers to the Bavarian Palatinate and the Baden State Railways in Germany.

These engines had outside cylinders 20 in. by 26 in. and coupled wheels 4 ft. 3 in. diam., the total wheelbase being 15 ft. 5 in. The front and third axles had side-play. The total heating surface was 1,440 sq. ft., of which the firebox supplied 115 sq. ft. The dome on the middle of the barrel was of the tall classic type with curves formerly so much in favour with the Manchester locomotive builders, and was provided with spring balance safety valves in addition to which there were Ramsbottom valves on the flush firebox shell. The weight in working order was 50½ tons. The tenders had four wheels only and weighed 24¼ tons in working order.

Subsequently the cylinders were reduced in diameter to 18½ in. For a time they were used for the heaviest coal trains on the main line, but are now set apart for the mineral trains between Rhymney (on the Brecon and Merthyr Railway), or Penrhos Junction with the Rhymney Railway, and Cadoxton sidings near Barry Docks, the gradients on the line from T.C. Junction to Rhymney being exceedingly severe.

(To be continued.)

AUTOMATIC SIGNALS ON SINGLE LINE, VICTORIAN GOVERNMENT RAILWAYS.

OPPOSING SIGNAL AT DANGER, FACING SIGNAL AT "CAUTION."

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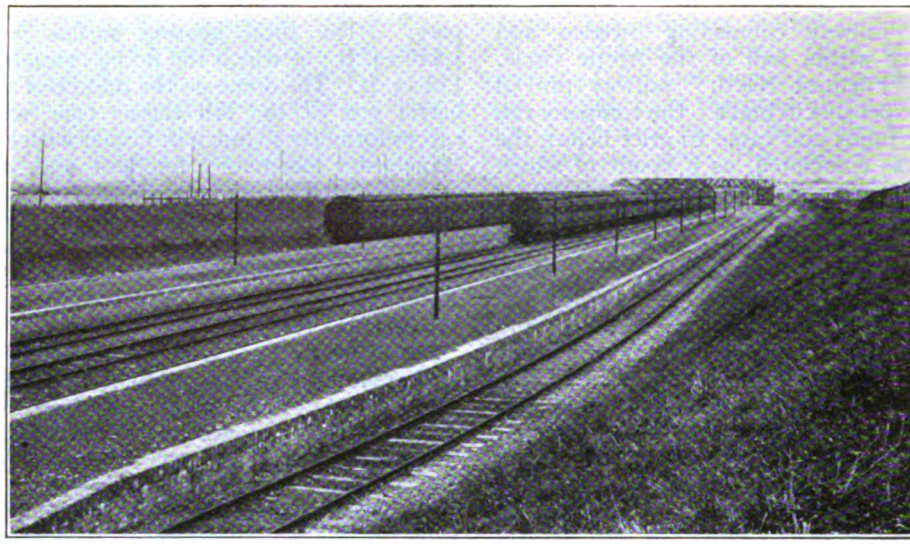

SLOUGH TRADING ESTATE PASSENGER STATION.

The Slough Trading Company's Railways.

By J. A. BOYD, M.I.A.E.

READERS of the RAILWAY MAGAZINE are closely in touch with the details of the working of the large railways of the world, but many are unaware of the railway services supplied by privately-owned undertakings, of which numerous examples are to be found, both at home and abroad. One of the latest and most complete of such systems is that belonging to the Slough Trading Company, on its trading estate at Slough, as briefly described in this article, the facilities which this company affords giving, in miniature, similar services to those given by the main line companies.

As a preliminary, it should be stated that the Slough Motor Depôt was originated during the war, and was intended for the repair of the whole of the motor transport of the British Armies in the field. It was then proposed to make use of the Richborough Train Ferry and to return to England all the motor transport which could not be conveniently repaired on the fighting fronts.

The Slough Trading Company purchased the Slough Depôt in 1920, together with motor transport and a very large stock of spare parts, accessories, &c., in France, Constantinople, Egypt, Mesopotamia, India, &c., for a round sum of approximately seven million pounds, and since that date the activities of the company have been chiefly in two directions :—

(*a*) A programme of selling the motor transport and spares therefor, and

(*b*) The development of the depôt and surrounding estate as an industrial centre, the latter forming the permanent programme of the company after the completion of the first.

It is not proposed in this article to describe the general features of this estate, other than to state that it includes approximately 650 acres of land, 90 acres of buildings, equipped with modern and developed industrial services, including electricity, steam, compressed air, water, town-gas, producer-gas, workmen's dwellings,

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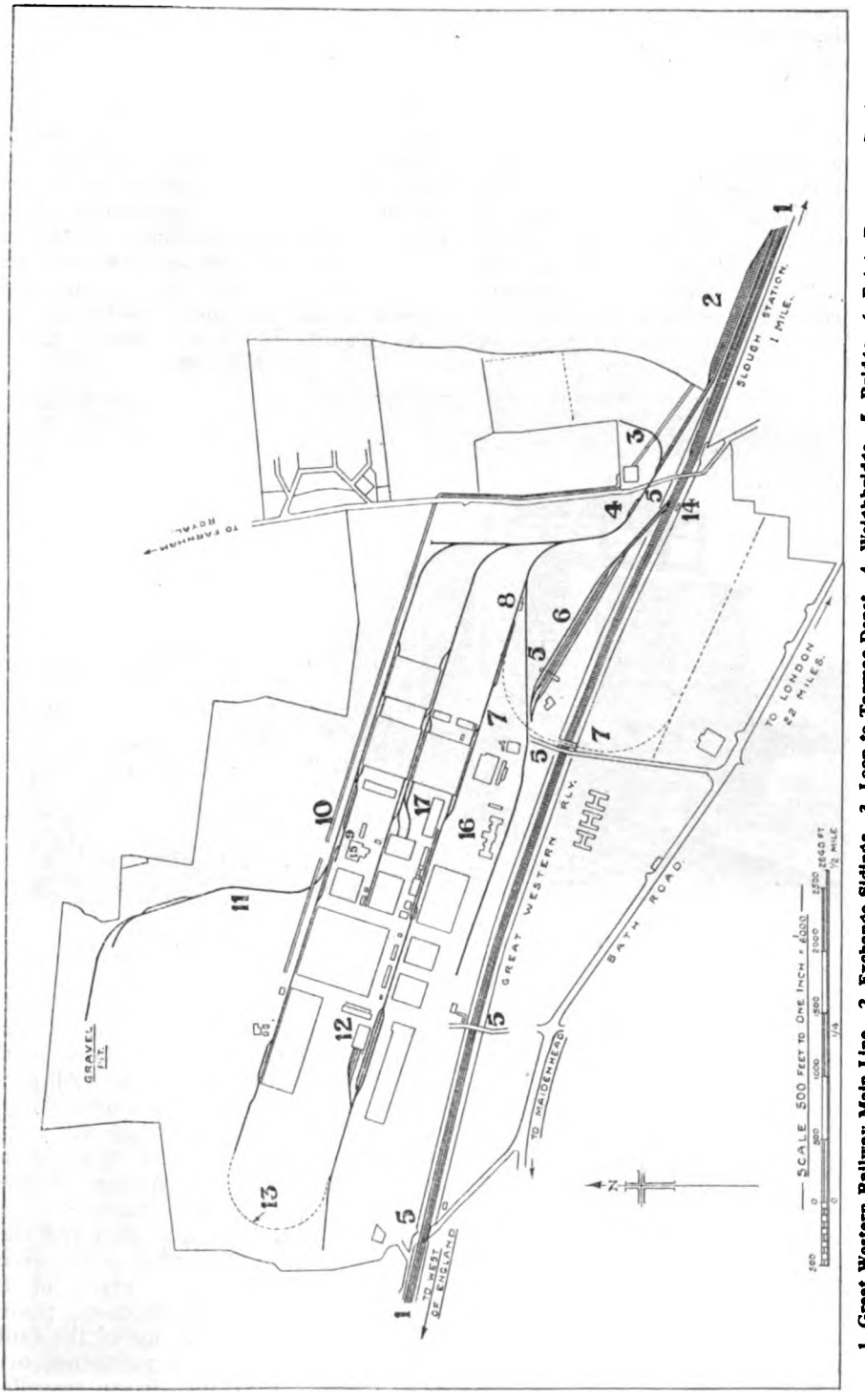

1. Great Western Railway Main Line. 2. Exchange Sidings. 3. Loop to Tarmac Depot. 4. Weighbridge. 5. Bridge. 6. Estate Passenger Station.
7. Proposed Development. 8. Engine Shed. 9. Coal Tippler at Power House. 10. Coal Storage and Traveller. 11. Loop to Gravel Pit.
12. Unloading Ramp. 13. Proposed Connecting Loop. 14. Great Western Railway Signal Cabin. 15. Power Station. 16. Main Offices.
17. Estate Goods Station.

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canteen, fire-brigade force, police force, administrative offices, labour department, welfare department, &c., all of which services are available for the use of tenants on the estate.

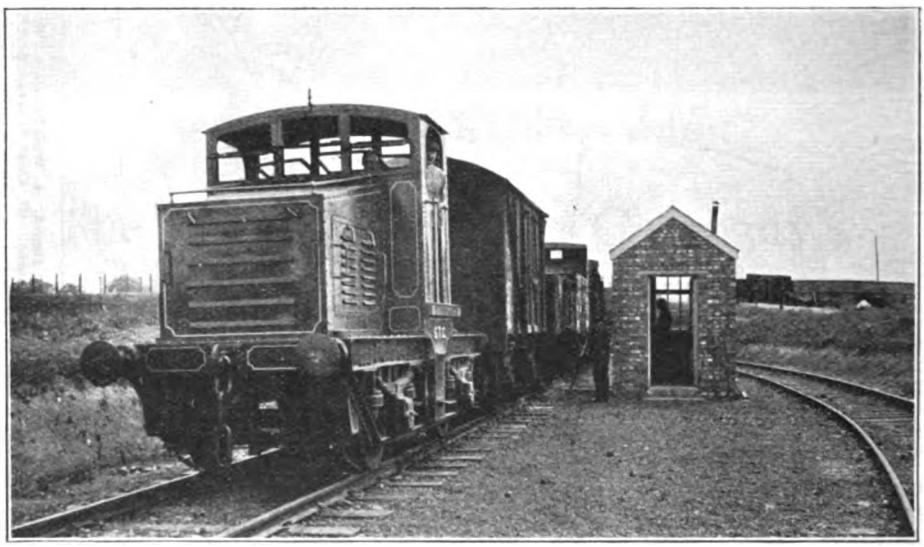
Dealing more particularly with the railway services provided, the general plan shows the lay-out of the railway tracks on the estate. Junction is made with the Great Western Railway at two points. All goods traffic passes on to the Great Western Railway at the Salt Hill sub-way, whilst the whole of the passenger traffic is connected to the same railway at a point close to the road leading from Slough to Farnham Common, the points and signals being operated from a signal-box controlled by the Great Western Railway.

Dealing first with the passenger side of the traffic, it should be stated that the Slough Trading Company have a private railway station. This is in direct communication with Paddington, and trains are run daily, for the convenience of the tenants on the estate, to Paddington and intermediate stations. By arrangement with the Great Western Railway, holders of workmen's tickets may travel on all trains run by the Great Western Railway into this station.

The station proper consists of two island platforms and five sets of tracks, with points at the western end. Usually certain trains remain in the station during the course of the day until again required. The station is electrically lit, and is provided with a bridge for crossing the tracks. Special tickets are issued by the railway department of the Slough Trading Company to all their employees and tenants on the estate. The importance of the railway traffic can be gauged by the fact that, at times, as many as 1,900 employees of the company and its tenants have passed through the station daily.

As regards the goods traffic, this is marshalled on five sets of tracks, extending from the Salt Hill subway to the Farnham Road bridge on the estate, as shown on the general plan above referred to. All goods traffic at this point passes over, and is weighed on, an Avery railway weigh-bridge, the weight tickets of which are accepted by the Great Western Railway in respect of all in and out traffic.

The tracks on the estate total over eight miles of single and double track, giving direct railway access to many of the buildings, and, in certain cases, passing into such buildings. Many of the buildings are provided with platforms, overhead cranes, electrically-driven travellers, electric run-ways, telphers, &c., for the



PETROL LOCOMOTIVE AND TRAIN PASSING OVER WEIGHBRIDGE.

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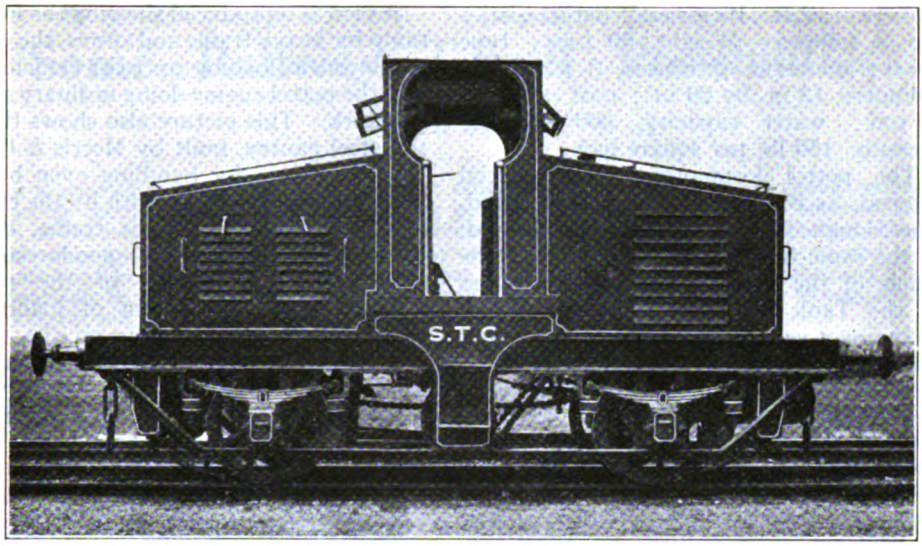

PETROL LOCOMOTIVE.

rapid handling of all goods inside such buildings. The tracks are built from 75-lb. rails, laid on plated English sleepers and spiked, change-over switches, stops, &c., being provided, as required, for the rapid handling of the traffic.

Rolling-stock includes two steam locomotives and one petrol locomotive. Locomotive No. 1, originally built by the Hunslet Engineering Company, of Leeds, was entirely re-built by the Slough Trading Company in 1920. Its chief characteristics are :—Weight, 32 tons ; type, 0-6-0 ; diameter of wheels, 3 ft. 4 in. ; cylinders, 14 in. by 18 in. ; coal capacity, 1 ton ; water capacity, 600 gallons ; pressure, 120 lb. per square inch.

Locomotive No. 2, originally built by Hudswell, Clarke and Co. Limited, was entirely re-built and modernised by the

GENERAL VIEW IN YARD SHOWING TRAVELLING CRANES, ETC.

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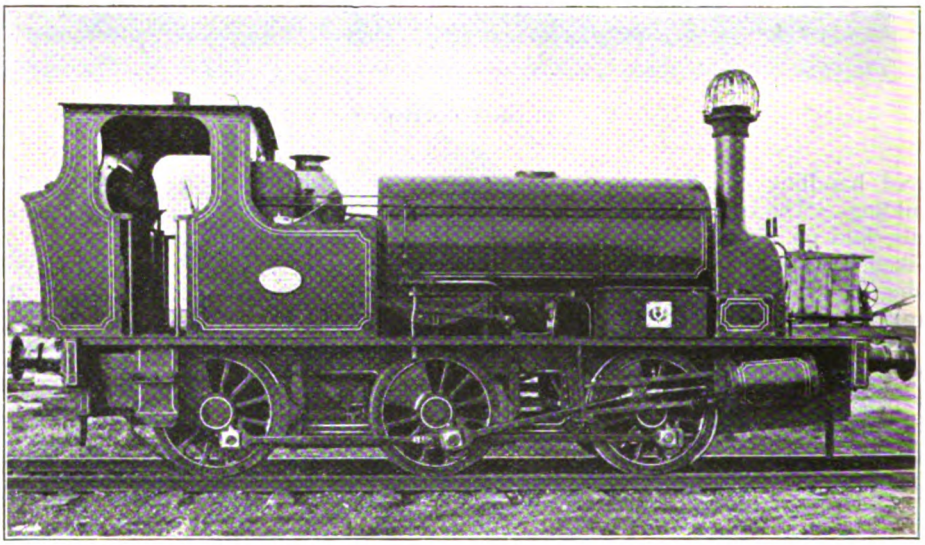
makers in 1920. Its general characteristics are as follows :—Weight, 30 tons ; type 0-6-0 ; diameter of wheels, 3 ft. 6 in. ; cylinders, 13 in. by 20 in. ; coal capacity, 1 ton ; water capacity, 600 gallons ; pressure, 150 lb. per square inch.

The petrol locomotive is of special interest, as it is the only one of its kind. The Slough Trading Company purchased, at the same time as the Slough depôt, the whole of the fighting tanks and supplies of the Tank Department of the Army, including a very large number of new tank component parts such as engines, radiators, fans, gear boxes, chains, &c. The petrol locomotive was built from such parts to the design of the author, who holds the position of Chief Engineer of the Slough Trading Company. The chief characteristics of this engine are as follows :—Weight, 14 tons ; wheelbase, 10 ft. 6 in. ; diameter of wheels, 3 ft. ; length overall, 22 ft. It has been in use for over 18 months, with very satisfactory results as regards maintenance, running costs, and general operation.

There are also eight wagons and two steam cranes. One of these, of "Coles" design, is capable of lifting 1 ton at 30 ft., 3 tons at 22 ft., 4 tons at 18 ft., and 5 tons at 16 ft. The other is of "Isles" type, capable of dealing with loads of 1½ tons at 32 ft. or 5 tons at 16 ft.

A view is reproduced showing the loading ramp for heavy traffic and stores, the cranes employed in loading up road vehicles and also the petrol engine doing ordinary shunting work. This picture also shows the 10-ton steel gantry, built by Morris & Co., of Loughborough, for handling even heavier loads than can be dealt with by the cranes.

As regards small goods traffic, this is dealt with at the estate goods station, situated at the centre of the estate. Tenants have the option of loading or unloading their rail traffic on the tracks adjacent to their premises or of handing them over at the goods station, for which a regular service of trucks is run morning and evening direct on to the Great Western Railway, thus enabling goods traffic to be despatched the same day by passenger train or special goods train to the required destination.



ONE OF THE ESTATE SHUNTING STEAM LOCOMOTIVES.

The railway department of the Slough Trading Company acts as general forwarding agent for road, rail and sea-borne traffic, direct from the estate to destination, thus reducing delays, handling, and risk of damage to consignments between producer and consumer.

The Slough Trading Company extend a cordial invitation to readers of the RAILWAY MAGAZINE to visit the estate and view the railway and other facilities which it offers to its tenants.

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Some Railway Travel Possibilities.

By A. W. D.

[In a sense it is premature to assume that railway traffic facilities under grouping conditions will include changes and developments in any particular direction. There are, however, many factors of the new railway situation which introduce useful and interesting possibilities. Hence the following study, from the pen of a railway officer of experience, is worthy of careful study and consideration, though it does not follow that all or any of the suggestions advanced can or will eventually be adopted, even if they are practicable, and in some cases there may be complicating factors which will materially influence future policy.—Ed. *R.M.*]

NOW that the time-table clerks of the railways are busy with the summer schedules, it is interesting to speculate as to new long-distance and cross-country services which could be put into operation without any additional capital outlay in the provision of new junctions and crossovers, and to offer a few suggestions. With only four great railway companies primarily concerned, the possibilities offered within each group are considerable, and readers of the Railway Magazine will find it worth while to study a railway map of Great Britain and see in what direction railway journeys can be made still more convenient for the travelling public. Only two of the railways are touched upon in these notes, viz., London Midland and Scottish and the London and North Eastern.

The London Midland and Scottish Railway, with its 8,000 miles of track, has two distinct routes all the way from London to Glasgow and Edinburgh, thus giving passengers choice of routes, outward from Euston and returning to St. Pancras, or *vice versa*. Day travellers can enjoy the varied and beautiful scenery of the Eden valley *via* Hellifield, while *via* Lancaster the line skirts the shores of Morecambe Bay and then climbs the Cumberland mountains, giving glimpses of Lake District scenery, near Penrith.

It may be that, to save time as well as coal, some of the St. Pancras-Edinburgh day trains will travel over the old Caledonian line from Carlisle to Princes Street station, leaving the London and North Eastern Railway to provide the necessary connections for such towns as Hawick, Melrose, and Galashiels. In other cases the through Edinburgh and Aberdeen trains from St. Pancras could continue to run *via* Hawick as at present. In the Glasgow direction, too, some of the day and night trains from the Central and St. Enoch stations could probably be amalgamated as far as Carlisle and run *via* Beattock—this route is much shorter than that *via* Dumfries.

Looking at the present Scotch services from Euston and St. Pancras, and excluding the newspaper trains, there are a round dozen of fast expresses, and, in addition to giving choice of routes, it would be a convenience if "periodic" timings could be arranged to start at the even hour from London, St. Pancras taking the odd and Euston the even numbers, as under :—

Dep.	a.m.	a.m.	a.m.	noon	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	night
Euston ..	—	10.0	—	12.0	—	2.0	—	8.0	—	10.0	—	12.0
St. Pancras	9.0	—	11.0	—	1.0	—	7.0	—	9.0	—	11.0	—

Any additional trains required, especially in the summer, to be run as second and third portions, five and ten minutes later.

Apart from the Anglo-Scottish services, it may be that periodic timings will also be provided for the principal expresses from London to some of the largest cities and towns. Manchester, with a population of four and a-half millions, within a radius of 25 miles from the Town Hall, may be cited as an example. Some of the fast-train departures from St. Pancras are already arranged on this basis, starting at 8.25 a.m. and continuing, with usually a two-hour interval, till 6.25 p.m., and this could be

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extended to include expresses from Euston. Starting at half-past the hour, St. Pancras would again take the odd numbers :—

Depart.	a.m.	a.m.	a.m.	a.m.	a.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.	p.m.
Euston ..	—	8.30	—	10.30	—	12.30	—	2.30	—	4.30	—	6.30	—
St. Pancras	7.30	—	9.30	—	11.30	—	1.30	—	3.30	—	5.30	—	7.30

It may be thought that a new train at 7.30 a.m. would be rather early, but it should be borne in mind that at present it is practically impossible for anyone to sleep in London and yet arrive at Manchester in time to do business before lunch ; apart from the newspaper trains, the 8.45 a.m. from Euston, and 8.25 a.m. from St. Pancras arrive at 12.40 and 12.55 p.m. respectively. Manchester has thus always been in an unfavourable position in this respect as compared with, say, Leeds, a similar distance from town, which has a through breakfast car express leaving King's Cross at 7.15 a.m., and arriving there at 11.20 a.m., gives one hour and forty minutes for business before 1 o'clock. It may be mentioned here that the suburban connections for this train are particularly good, people living out, even as far as Edgware, being enabled to get to King's Cross in time to join up.

It will be seen that a train is put down to leave at 7.30 p.m. from St. Pancras, and this would be much appreciated by travellers wishing to stay as long as possible in London and yet have a good night's rest in Manchester—the Midland Hotel is only a few yards from the Central station—while if the pre-war timing of 3 hours 35 min. were reverted to, the train should become a very popular one.

The services with other towns from both Euston and St. Pancras could be arranged similarly—for instance, the fast trains for Birmingham and Wolverhampton could leave Euston, say, at 15 min. past the hour, with two-hour intervals, at 9.15, 11.15 a.m., 1.15, 3.15, 5.15 and 7.15 p.m. ; Liverpool and Birkenhead, at, say, 45 min. past, at 8.45, 10.45 a.m., 12.45, 2.45, 4.45 and 6.45 p.m., and so on for Northampton, Coventry, Nottingham, Sheffield, Bradford, etc.

A new business route which could be opened up is that between South Staffordshire and St. Pancras. The present service between Birmingham and Luton (with a population exceeding fifty thousand), Bedford and St. Albans, *via* Leicester, leaves much to be desired, and it would probably pay to divert some of the semi-fast trains between Euston and Birmingham calling at Rugby and Coventry, to St. Pancras and run *via* Olney and Northampton —very little extra time need be taken on the journey. At present, it is often quicker to travel from Luton to St. Pancras and then on from Euston to Birmingham by one of the two-hour expresses.

The North Wales coast resorts have become very popular of late years, but residents living in such towns as Luton, Bedford, Wellingborough, Kettering, Market Harborough, Loughborough, etc., have not hitherto found it sufficiently easy of access, and have, therefore, spent their holidays on the East or South coasts, where through carriage facilities are available—in the case of a family, this is practically essential.

We may, therefore, anticipate a luncheon car express leaving St. Pancras during the summer months for North Wales, picking up at these towns *en route* and travelling *via* Leicester, Castle Donington, Tutbury (or Knighton Junction, Coalville, Burton-on-Trent, Tutbury), Stoke-on-Trent, Alsager and Crewe, and thence over the old London and North Western line. Such a train would be well patronised, and, incidentally, it would provide new business facilities between the Potteries and places on the old Midland system, as well as Chester and Birkenhead.

The London and North Eastern Railway has three London termini : Marylebone, King's Cross and Liverpool Street, two of which deal with an enormous suburban traffic. It may be suggested that through services to Yorkshire and Scotland from Liverpool Street and Marylebone, in addition to King's Cross, would, therefore, prove very popular. Take the case of a season-ticket holder living, say, at Chingford. When he has business to do in Edinburgh, it will be a simple matter for him to walk from his local platform at the City terminus to a Scotch express

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starting from a main platform, especially when he has luggage, rather than to make his way by taxi or by "Underground" to Euston or St. Pancras or King's Cross, as he has to do now. The same thing applies to Marylebone, in the case of residents in the West and North-West suburbs, and, apart from this, such a facility would be much appreciated by people living in the west end of London itself. An equally important point to remember is that many big towns which would be tapped *en route* from Marylebone have hitherto been better served for through traffic by other routes.

In the evening four Scotch expresses now leave King's Cross terminus at 7.30, 8.25, 10.20 and 10.30 p.m. The first-mentioned is the "Highland" express, and, on account of its fast timing, it will be better to continue to start from its present headquarters, and the same remarks will apply to the 10.30 p.m. train. The 8.25 and 10.20 p.m. trains could, however, commence their journey northwards at Marylebone and Liverpool Street, respectively, though part of their work would probably have to be given to other trains on the Great Northern section, and it would not matter very much if slightly earlier starts were made in view of the longer routes to be covered; a passenger is usually satisfied with an arrival in Scotland about 8.0 or 8.30 a.m., while if a breakfast car were attached to the train at the Border, the destination time could be 9.0 or even 9.30 a.m.

The 8.25 p.m., starting from Marylebone, would pick up at Woodford—for connections from the Great Western system *via* Banbury, Rugby, Leicester, Loughborough, Nottingham and Sheffield, and join up with the old East Coast route at Doncaster.

The 10.20 p.m. train, starting, say, at 9.45 p.m. from Liverpool Street, would travel by way of Cambridge, Ely and March, thence over the former Great Northern and Great Eastern joint line through Spalding, Sleaford, Lincoln and Gainsborough to Doncaster. A glance at the map will show that many of these places are important junctions for cross-country lines serving Lincolnshire and the whole of the Eastern Counties, and the business communities at Ipswich, Norwich and Yarmouth would welcome such an innovation if suitable connections were given.

The same principle could, doubtless, be applied to some of the day trains to Scotland as well as to Leeds, Bradford, Newcastle, Middlesbrough and other important towns and ports on the North-East Coast;

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*F. E. Mackay.*

Up Liverpool express.
London and North Western locomotives, 4-4-0 No. 1980, "Neptune," 4-6-0 No. 354.

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it would certainly be a distinct novelty for, say, a Cambridge Professor, to step into a dining car for Aberdeen at his own local station.

New cross-country routes will also receive their due share of attention. Included in the London Midland and Scottish system is the longest length of track under one management in Great Britain, *viz.*, that from Wick to within a few miles of Bournemouth (Broadstone Junction), a distance of 680 miles, and it may be that, during the summer, through carriages will be run. The number of "throughout" passengers would not be large, but the facility would provide an additional means of getting to the South Coast from the many cities and towns served on the way; the advertising value of coaches boldly labelled on the roof "Through Carriage, Bournemouth, Crewe, Carlisle, Perth, Inverness, Wick," would be considerable.

By arrangement with the Great Western, another coach could start from Penzance and, travelling *via* the Severn Tunnel, join up with the Bournemouth carriage at Crewe. Such a coach could be labelled "Land's End and John O'Groats," and would be welcome during the period when the cycle and motor cycle trials take place.

With such long distances to be covered, an improved type of vehicle may be required, the seats being easily convertible for either day or night travel as required, so that both first and third-class ticket-holders may sleep in comfort. Some very excellent and economical cars of such types have recently been built in this country for the "intermediate class" on the Continental railways.

Another route available is that between the ports of Swansea and Yarmouth, quite apart from Norwich, and a through train would give new facilities to the following towns: Swansea, Llandrindod Wells and the Central Wales spas, Shrewsbury, Stafford, Nuneaton, Leicester, Melton Mowbray, and thence over the joint Midland and Great Northern line *via* Lynn. At the present time travellers between South Wales and the Eastern counties proceed *via* London, and the traffic is entirely lost to the London Midland and Scottish Railway, but if such a service were put on and well advertised, more and more people living in the Principality could be persuaded to spend their holidays at such bracing resorts as Cromer, Yarmouth, Lowestoft, Sheringham and Mundesley, as well as on the Norfolk Broads. In the reverse direction, the mountain air and moorlands of Central Wales, quite apart from the medicinal value of the Spa waters of Llandrindod Wells, would be a delightful change from Norfolk, Suffolk and the eastern counties generally.

Observation cars have hitherto not been run to any extent in this country, much to the surprise of visitors from overseas, as the lovely views of hill and dale deserve to be seen to the best advantage, in the same way as is done abroad. The London and North Western Railway was the first company to build such cars to run on the summer trains from Llandudno along the Conway Valley to Bettws-y-coed and Blaenau Festiniog, and they proved immensely popular with holiday-makers. They were entirely enclosed with glass at the sides and ends, the seats had movable backs, and an attendant in uniform collected a small supplementary charge over and above the third-class fare, and also described the principal points of interest *en route*. Following on this, the Caledonian Company introduced Pullman cars for first-class passengers, to run on the Callander and Oban line. The arrangement might very well be extended to, say, the following services: St. Pancras-Manchester —attached to trains traversing the lovely Peak District during the hours of daylight. Euston-Holyhead day boat trains —for the scenery along the North Wales Coast—cars attached, say, at Chester. Also Perth to Inverness and Mallaig to Glasgow.

Local services will also receive their due share of attention in view of the strong motor 'bus competition on the roads, and, in this connection, Watford may be mentioned. With a population exceeding 50,000, it is the centre from which radiate many 'bus routes to surrounding towns and villages, including St. Albans, Harpenden, Luton, Dunstable, Rickmansworth, Uxbridge, Berkhamsted, etc., etc., quite apart from the London General Omnibus Company's services to town *via* Stanmore and Edgware.

When the Midland Company extended their line from Bedford to St. Pancras, a short length of rail was laid down between

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Park Street on the London and North Western St. Albans branch and Napsbury for the conveyance of contractor's material, but when the extension was completed the permanent-way was taken up. The old bridge over the London-St. Albans road is still in existence, and if the connection were restored, it would enable local trains to be run between Watford and Bedford *via* St. Albans, Harpenden and Luton, and Kings Langley, Watford, Bushey, Hatch End, Harrow, Wembley, Willesden, Kilburn and Camden Town, and run thence non-stop to Westcliff *via* Homerton and Bromley, the route taken by the new Broad Street-Southend trains.

Railway publicity will also receive the attention it deserves, and interest in this subject has recently been excited by the proposal to hold the 1924 Convention

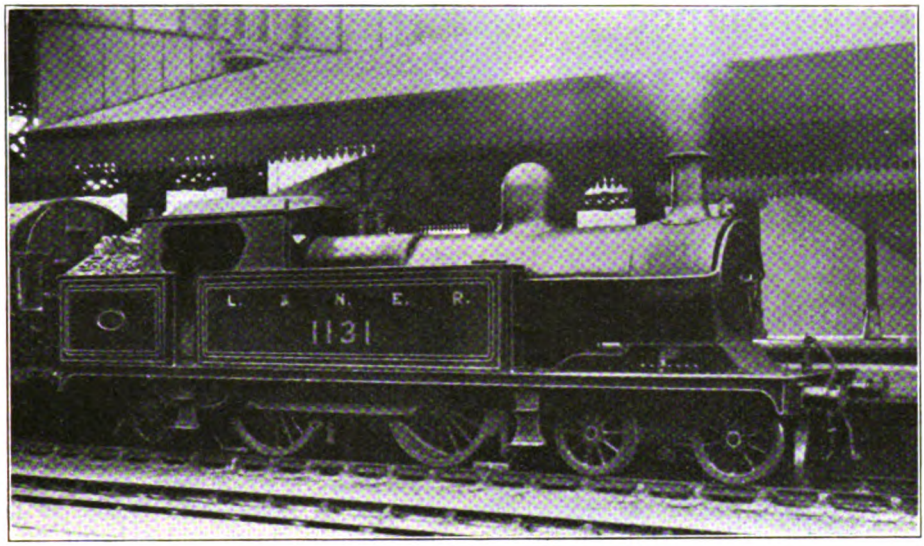


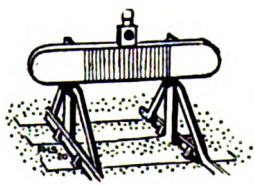
Photo.] LONDON AND NORTH EASTERN RAILWAY. [*T. G. Hepburn.*

Great Central 4-4-2 tank engine, with new lettering and numbering, at Nottingham.

so regain some of the traffic diverted to the road. Many other connections will suggest themselves up and down the country.

Excursion facilities may also be improved and extended, and, to mention only one instance, it would be a paying proposition to put on day and even half-day trains, from Willesden, Harrow and Watford to Southend and Westcliff. Starting at Berkhamsted, the train would pick up at Boxmoor, of American Advertising Experts in London.

The possibilities in the direction of efficiency and economy within the new railway groups, on the completion of the reorganisation which is now taking place, are very great, and these few suggestions are put forward as indications of developments which may assist to re-create the "travel habit" which existed prior to the war.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A. M.Inst.T., A.I.Loco.E.

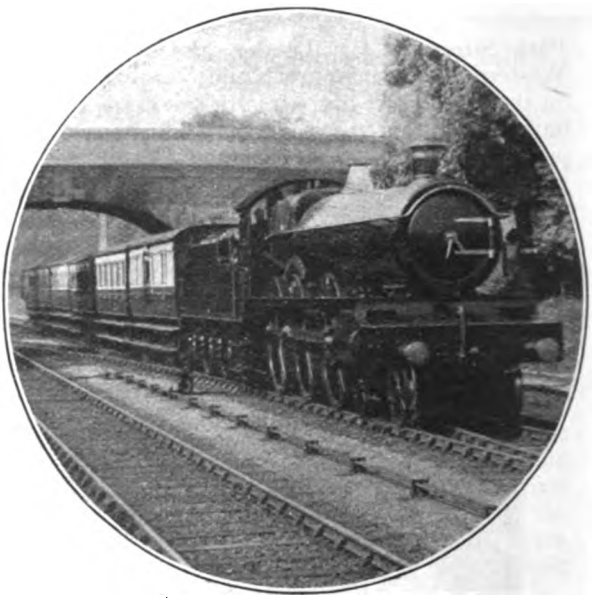

Photo.] [*Raymond Walker.*

GREAT WESTERN RAILWAY.

Local train approaching Bathampton.
4-6-0 locomotive, No. 2920, "Saint David."

A QUESTION affecting locomotive constructional practice, and arising directly out of the extraordinary feats of locomotive performance detailed both in the last article of this series, and in the present issue, is the nature of the changes in modern, as compared with previous locomotive design, which permit of the attainment and maintenance of such tremendously high speeds on a level road. In last month's article I hinted briefly at one explanation; there is no doubt that the substitution of piston-valves and superheated steam for slide-valves and saturated steam is largely responsible. With the most efficient methods of lubrication possible, the considerable steam pressure on the back of the old D-shaped slide-valve must always occasion at high speeds a considerable loss of power by friction, except in the few instances in which balanced slide-valves are provided; such frictional loss is virtually absent in the piston-valve. The reversal of the steam flow through an angle of 180 deg. under the back of an ordinary slide-valve, again, as compared with the fairly straight flow through a piston-valve in both directions—with no change of direction worse than 90 deg., at any rate—is distinctly in favour of the piston-valve engine. Indeed, the whole question of directness of steam-flow, as expressed in absence of angles and bends, as far as possible, in steam and exhaust pipes, is one which has received very close attention in recent designs; the prominent straight steam-pipes at the sides of the smokebox on the latest Great Northern types, though they may not make for beauty of external lines, are important examples. And then the very power medium itself—the steam—is by the agency of superheat converted into a perfect gas, with greater capacity for rapid flow than it has in the saturated condition.

It was anticipated, in the early days of the steam locomotive, that the coupling of driving wheels, while offering essential advantages in the increase of adhesion weight, would militate severely against speed. This is to-day, however, an exploded theory. The astonishing Great Western performances detailed last month were made by six-wheels-coupled engines, and the same type is responsible for having given me the highest sustained speed—90 m.p.h.—that I have yet recorded. On most British railways, other dimensions being equal, any difference in capacity for speed displayed by single, four-coupled and

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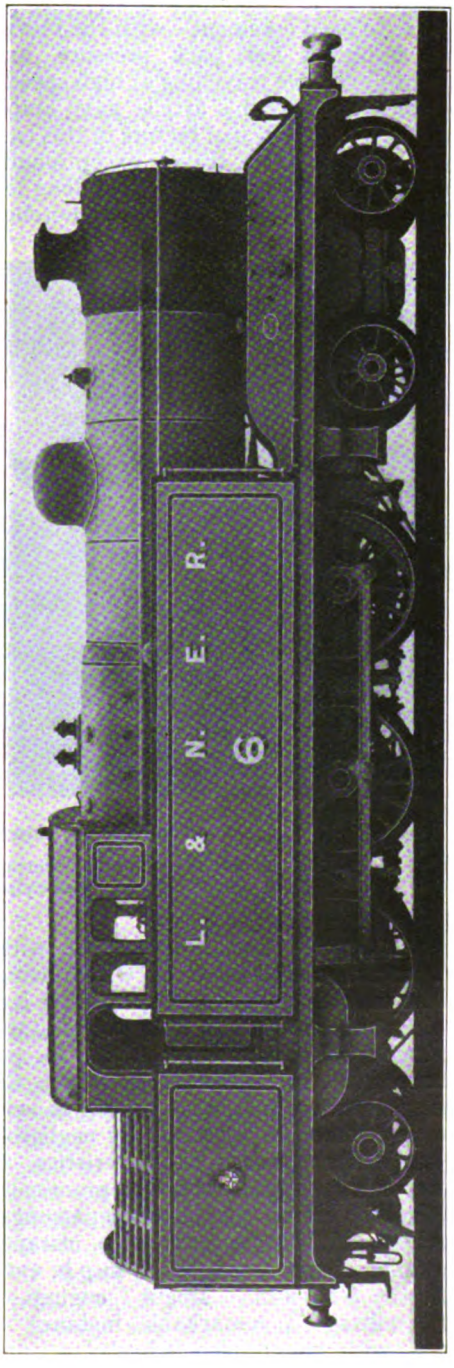
six-coupled express engines has been non-existent, and one can only suppose that the reduction of the slight, but constant, slipping that takes place during ordinary express running with single-driver engines, and to a lesser degree, in all probability, with four-coupled engines, tends to balance the slight increase of the internal friction of the machine as a whole by coupling three axles instead of two. A Great Western 2-cylinder 4-6-0, moreover, has the further disadvantage, as concerns the theoretical limitation of maximum speed capacity, of a 30-in. piston stroke, which results in very high piston speeds when the engine is travelling fast. And yet, strangely enough, these 30-in. stroke 2-cylinder engines are distinctly faster machines on the level than their 26-in. stroke 4-cylinder sisters.

There are, however, many considerations other than those of piston-valves, steam superheat, coupling rods and piston stroke, which enter into the question of high-speed capacity. The whole of the exhaust arrangements of a locomotive have a strong influence on realisable speed. It has more than once been remarked that it is easier to get steam into a cylinder than it is to get it out again, and the higher the speed developed by the locomotive, the more apt does this contention become. The late Mr. D. Drummond, in experimenting with two early 4-4-0 engines on the London and South Western Railway, which for the purposes of the tests were run light at high speeds, found by indicating that at 62 m.p.h. both 6-ft. 6-in. and 7-ft. engines were developing 600 i.h.p., and that at 70 m.p.h. the 6-ft. 6-in. engine was actually developing 912 i.h.p. in its own propulsion alone. That is to say, in the latter case the back pressure in the cylinders must have been as high as 18 lb. per square inch, according to the calculations of that well-known authority, Mr. E. L. Ahrons. A similar test on the Great Northern "Atlantic," No. 251, in 1904, prior to superheating, showed that at 75 m.p.h. the mean back pressure had only advanced from 6½–7 lb. per square inch (at speeds up to 58½ m.p.h.) to a maximum of 9½ lb. per square inch; many steps had been taken by Mr. Ivatt in the design of the latter engine with a view to reducing the internal power consumption of the machine, but the most important was, without doubt, the provision of balanced slide-valves exhausting directly through the back. Since then, in the superheated "Atlantics," piston-valves have taken the place of slide-valves, and the



NEW 4-6-2 SUPERHEATED TANK LOCOMOTIVE, LONDON AND NORTH EASTERN RAILWAY (GREAT CENTRAL SECTION).

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capacity for free running at speed has been further increased.

The Great Western locomotive authorities have certain tricks of valve-setting with their engines which result in an exceedingly rapid exhaust—its explosive character is too well-known and characteristic to need comment—with the inevitable result of low back pressure, and astonishingly free travelling at high speeds, to which last month's article gave ample witness. The principal factors in this case are a lengthy valve travel, exceptionally large steam and exhaust ports, a long lap (which enables the engines to be notched

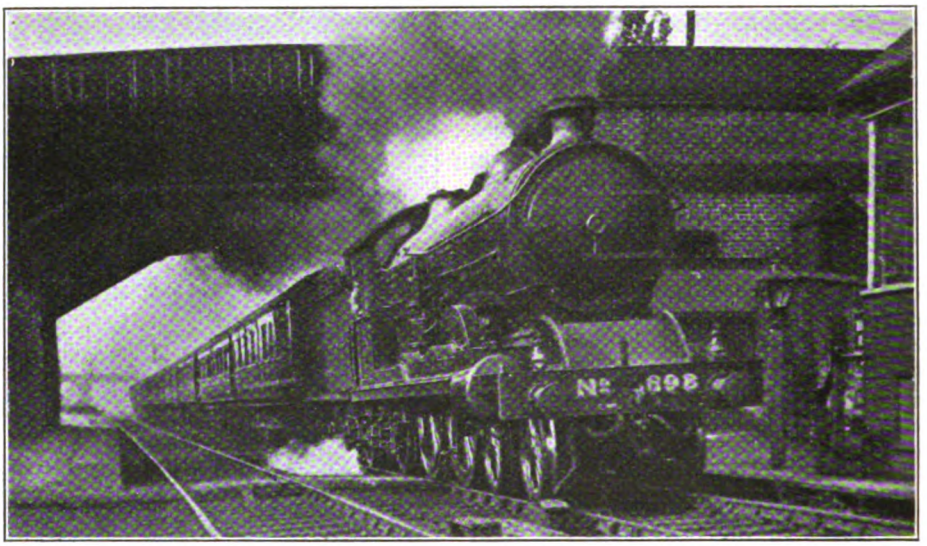

Photo.] LONDON & NORTH EASTERN RAILWAY. [*W. Rogerson.*

Up Newcastle-Manchester and Liverpool (L. & Y. route) express passing Croft Spa.
North Eastern two-cylinder 4-4-2 locomotive, No 698.

up considerably when running fast, without undue compression or wiredrawing, as the exhaust port is left open quite late in the stroke despite an early cut-off), and a very high boiler pressure of 225 lb. per square inch, in opposition to which the back pressure, which must in itself be very low, is reduced to a practically negligible figure. These same characteristics, in more or less degree, extend to practically all Great Western types used on passenger service, and I hope shortly to instance examples of speeds up to 72½ m.p.h. even with the 5-ft. 8-in. "Mogul" engines of that railway—a remarkable instance of speed with six-coupled wheels of such small diameter. I have noted a similar feat on the Great Northern line also, recently, with one of the large-boilered 2-6-0's of the 1640 series, having the same diameter driving wheels.

There is another point of considerable importance, urged by Mr. E. L. Ahrons in this connection, and that is a matter really unconnected with the mechanical design of the engines. Mr. Ahrons brings figures to prove that locomotives which he had timed, round about the years 1884–1892, as incapable of speeds higher than a maximum of 70 to 76 m.p.h., had some 10 years later, or a little over, become capable of maxima of 80 to 82 m.p.h., down suitable gradients in each case. In the interim no material change had been effected in the design of the engines concerned, but the tensile strength of the tyres in use had increased from 36–40 tons per square inch to 45 tons and over, while the hardness of rails had not only increased, but the section of the latter on the railway in question had been stiffened from 85 lb. to 100 lb. per yard. Thus there was not only less bending of the rails between the chairs under the rolling load, but also less crushing and flattening of the tyres at the point of contact between the tread and the upper rail surface. This seems an unassailable

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argument. Add to it the fact that, since the war, the hardness of tyres and rails is unceasingly on the increase, tensile strength of the steel in both cases up to 60 tons per square inch and over being now common; couple with it the widespread introduction of superheated steam and piston-valve distribution; and therein you have fully adequate reasons, of a general nature, for the vastly enhanced speed capacity of modern express locomotives, as witnessed in my articles of last month and this month.

glorious sprint for "home." Speed steadily accelerated until just before Raskelf the "eighty" mark was reached, and although mile-post records were not possible in the darkness, it is clear that the speed must have been maintained on the level at or above the 80 m.p.h. mark for fully 10 miles consecutively. My friend (who, by the way, had had no preliminary conversation with the driver) gives 81·8 m.p.h. as the absolute maximum, which means that the speed must have continued for miles at an extra-

TABLE A.

LONDON AND NORTH EASTERN (NORTH EASTERN) RAILWAY: YORK—DARLINGTON.

Distance.	2163 Linfoot. 30 211 220	*Average speeds.	Engine No. ,, Driver. Load (axles). ,, (tons tare). ,, (tons full).	Distance.	2165 Bond. 48 341 360	Max. and Min. †speeds.
m. ch.	m. s.	m.p.h.		m. ch.	m. s.	m.p.h.
44 10	42 55	—	York	0 00	0 00	—
	Sigs.					
42 43	38 35	70·1	Poppleton Junction ..	1 47	4 15	—
41 00	37 16	79·2	Skelton Bridge	3 10	6 15	—
38 50	35 28	81·6	Beningbrough	5 40	8 50	62½
34 31	32 21	81·6	Tollerton	9 59	12 55	68
32 75	31 17	81·2	Alne..	11 15	14 15	67
30 60	29 40	79·7	Raskelf	13 30	16 10	67
28 04	27 38	77·9	Pilmoor	16 06	18 35	67
26 10	26 09	76·4	Sessay	18 00	20 20	69
21 74	22 45	74·6	Thirsk	22 16	23 55	72½
17 46	19 15	68·0	Otterington	26 44	27 40	69
14 14	16 15	66·3	Northallerton	29 76	30 45	67
10 32	12 50	65·8	Danby Wiske	33 58	34 00	72½
6 74	9 40	55·6	Cowton	37 16	36 55	—
5 18	7 50	54·0	Eryholme	38 72	38 30	65
2 48	4 55	31·7	Croft Spa	41 42	40 45	72½
0 00	0 00	—	Darlington	44 10	44 35	—

* Station-to-station averages.

† Maxima and minima by chronograph, at or near stations shown.

I come now to the remarkable effort of Driver Linfoot, briefly mentioned at the conclusion of my April article, on the 43-min. "flier" from Darlington to York, tabulated on the left-hand side of the table above. In the third column I have averaged out the speeds from station to station, and from these it will be seen that Linfoot's method consisted in running fairly easily as far as Northallerton, with a view to avoiding trouble from the preceding up mail train at the York end of the journey, after which followed a ordinarily even figure, seeing that the average from Alne throughout to Beningbrough was 81·6 m.p.h.

Some of the averages provide astonishing reading; the 7 miles, 70 chains from Raskelf to Beningbrough were covered at a mean speed of 81·5 m.p.h.; the 12 miles, 76 chains from Pilmoor to Skelton Bridge at 80·7 m.p.h.; the 14 miles, 70 chains from Sessay to Skelton Bridge at 80·3 m.p.h. (which shows that the exact 80 average was maintained for a shade over 15 miles); the 21 miles, 4 chains from

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Otterington to Beningbrough at 77·9 m.p.h.; the 28 miles, 29 chains from Northallerton to Poppleton Junction at 76·2 m.p.h.; and the 32 miles, 11 chains from Cowton to Poppleton Junction, despite last month, over one-half the journey from Bristol to Paddington. Net time, by the way, was about 41¼ min. from Darlington to York, on the basis of last month's computations. It is sad to relate that this was

TABLE B.

LONDON MIDLAND AND SCOTTISH (LONDON AND NORTH WESTERN) RAILWAY: BIRMINGHAM—EUSTON.

Distance.	Engine No. / Name / Type / Load (axles) / (tons tare) / (tons full)	1730 *Snipe* 4-4-0 "George the Fifth" class. Schedule.	22 160 170	1504 *Boarhound.* 4-4-0 "George the Fifth" class. 22 157 165	Schedule.	32 229 240	63 Unnamed. 4-6-0 "Claughton" class. Distance.	Schedule.	32 222 235	†Speeds.
m. ch.		min.	m. s.	m. s.	min.	m. s.	m. ch.	min.	m. s.	m.p.h.
0 00	New Street	0	0 00	0 00 Sigs.	0	0 00	—	—	—	—
1 71	Adderley Park	—	3 23	4 00	—	3 45	—	—	—	—
3 61	Stechford	—	5 20	6 03	—	5 52	—	—	—	—
6 41	Marston Green	—	7 45	8 30	—	8 25	—	—	—	—
10 05	Hampton	—	10 40	11 42	—	11 37	—	—	—	—
13 33	Berkswell	—	13·40	14 55	—	14 50	—	—	—	—
15 30	Tile Hill	—	15 35	16 53	—	16 50	—	—	—	—
18 74	Coventry	19	18 33	19 50	21	20 10	0 00	0	0 00	—
23 65	Brandon	—	22 30	23 50	—	24 25	4 71	—	7 15	57½
29 54	Rugby, No. 7 Box	—	27 50	29 35	—	30 20	10 60	—	13 30	—
30 27	Rugby	31	28 50¶	30 35¶	33	31 15¶	11 33	13	14 35¶	34¶
37 49	Welton	—	37 12	38 57	—	39 40	18 55	—	23 35	—
43 13	Weedon	—	42 03	43 52	—	44 56	24 19	—	28 25	71½
50 04	Blisworth	—	48 15	50 00	—	51 19	31 10	—	34 30	67
52 79	Roade	54	51 00	52 47	56	54 10	34 05	36	37 10	62½
58 10	Castlethorpe	—	55 25	57 00	—	58 50	39 16	—	41 25	77½
60 36	Wolverton	—	57 20	58 57	—	60 57	41 42	—	43 15	—
66 16	Bletchley	67	62 38	64 15	69	66 22	47 22	49	48 15	69
72 53	Leighton	—	68 38	70 07	—	72 37	53 59	—	54 05	62½
76 62	Cheddington	—	72 30	73 48	—	76 35	57 68	—	58 00	61
81 15	Tring	83	77 05	78 10	85	81 15	62 21	65	62 25	57
84 73	Berkhamsted	—	80 43	81 45	—	84 55	65 79	—	66 00	—
88 30	Boxmoor	—	83 48	84 45	—	87 50	69 36	—	68 45	78
91 76	King's Langley	—	86 53	87 35	—	90 46	73 02	—	71 25	80½
95 35	Watford	97	90 00	90 23	100	93 46	76 41	80	74 10	72½
96 75	Bushey	—	91 22	91 37	—	95 05	78 01	—	75 25	66
99 47	Pinner	—	94 02	94 03	—	97 32	80 53	—	77 50	—
101 40	Harrow	—	95 50	95 40	—	99 10	82 46	—	79 25	71½
104 65	Sudbury	—	98 45	98 30	—	101 53	85 71	—	82 10	74
107 41	Willesden Junction	109	102 00	101 30	112	104 08	*87 37	92	*84 15	—
112 71	Euston	—	—	—	120	110 25	—	100	—	—

* Signal stop at 6½ mile-post.

¶ Service slack.

† Maxima and minima by chronograph, at or near stations shown.

the easy running over the first 10 miles or so, at precisely 75 m.p.h. That is to say, all but three-quarters of the journey was traversed at a 75 m.p.h. average—a feat comparing on fully level terms with the similar Great Western average, detailed

Linfoot's last week on main-line passenger service, as under the age limit he has since been transferred to local trains. So this journey, as my friend aptly remarks, was in the nature of a "swan song."

With it, on the right-hand side of the

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table, I show a recent trip of my own on the 9.28 p.m. north-bound express (5.30 p.m. from King's Cross), allowed 45 min. for the run, with the tendency of the road slightly against the engine. The merit of Driver Bond's work on this occasion lay in the fact that the load was two vehicles above normal, 360 tons being a substantial figure for such a booking. This is more especially the case in that the start has to be made round the sharp and awkward curve from No. 14 platform at York, which nearly always occasions slipping with "Atlantics," unless they are very carefully handled, and in any case prevents a rapid to Beningbrough, 15½ min. to Alne, 20 min. 20 sec. to Pilmoor, and 26¼ min. to Thirsk, barely exceeding 60 m.p.h. to this point; but with maxima of 66 m.p.h. here, 69 at Danby and 67 at Croft, and minima of 61½ at both Northallerton and Eryholme, we passed the two latter stations in 33½ min. and 42 min. 5 sec. respectively, and reached Darlington in 48 min. 5 sec.—not a bad effort, although in no way comparable to that of Driver Bond, just described.

From these runs I pass to a number on different lines in which 4-4-0 engines have been concerned, with lighter trains. On the Birmingham service of the late London

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*Henry L. Salmon.*

Down Manchester express near Syston (Midland Division.) Midland three-cylinder compound 4-4-0 locomotive No. 1036.

start being made. But once through Beningbrough, we got away in fine style, the chronograph speeds noted at the side of the table being indicative of our progress. Maxima of 72½ m.p.h. at both Thirsk and Danby Wiske, on the level in each case, were notable figures with such a load. The 36 miles, 2 chains from Beningbrough to Croft Spa were covered at an average of 67·7 m.p.h.; from Tollerton to Croft, 31 miles, 63 chains, the average rose to 68·5 m.p.h. With an old-time run in from Croft, we should have made Darlington in 44 min. On another occasion, with No. 2172, and a very heavy 54-axle train of 420 tons, we took 9¾ min. and North Western—it still was the North Western when the runs were made—two trips on the 4.50 p.m. up two-hours' express, which calls at Willesden and is booked to complete the 107·5 miles from New Street to that point in 109 min., would want some beating. The correspondent who timed them I well know to be an accurate recorder of passing times, but his maximum and minimum speeds, read from the second hand of an ordinary watch, are over-estimated in the majority of instances—especially the high speeds—and I am therefore unable to include them in the records. For purposes of comparison, I have added to the table the note-

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worthy "Claughton" effort on the 2.30 p.m. from Birmingham to Euston, which I detailed in my March article of 1922, and of which the chief feature was the time of 58 min. 35 sec. over the 67 miles 16 chains from Welton to Sudbury, giving an average of 68·8 m.p.h. Neither of my friend's two runs managed to equal that figure, although *Boarhound*, on the second journey, got as near as 59 min. 33 sec. The other two corresponding times were 61 min. 33 sec. and 62 min. 13 sec.

The same driver—W. Taylor, of Camden shed—was the officiating genius in each of the first three runs. On the first of them, passed. After that there is a close correspondence between the times on to Bletchley, except that the faster running down from Roade to Castlethorpe was made on the second journey; then *Boarhound* went ahead in great style, and succeeded in making Willesden in 101½ min. from Birmingham, or 100¾ min. net for the 107½ miles.

Take the New Street-Weedon time out of the first journey, and add it to the Weedon-Willesden time of the second, and you have a total of 99 min. 41 sec. for a journey of 107½ miles, start-to-stop—no mean achievement for 4-4-0 engines even

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*F. E. Mackay.*

Up Liverpool restaurant car express.
London and North Western 4-4-0 locomotive No. 2242 "Meteor."

"even time" had been attained as soon as Coventry—the running to this point was about equal to that required on one of the 19-min. start-to-stop bookings—and Rugby was passed, at reduced speed, 2¼ min. in advance of schedule time. Gaining on time continued without intermission, however, and the result was that on passing Watford, Taylor had 7 min. in hand, which appeared to satisfy him, as easy running followed to Willesden. On the second run a slight signal check occurred immediately after leaving New Street, occasioning a loss of ¾-min., and the travelling was less energetic than on the previous journey, until Rugby had been so lightly loaded as 165 tons behind the tender. The time of 13 min. 55 sec. on the run last described from Bletchley up to Tring, 15 miles, was particularly fine, and the minimum rate at the top of the 1 in 330 can have been but little below 60 m.p.h. On this journey my friend claims two "eighties"—at Castlethorpe and King's Langley, but from the speeds on my own contemporary trip, in the fourth column, and the station-to-station averages, it is tolerably clear that the speed cannot have exceeded 78 m.p.h. in the former case, and 77 in the latter.

The run shown in the third column succeeded a late arrival (by nearly a quarter-

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of-an-hour) of the train at New Street; the actual start was 13½ min. behind time, and cautious travelling as far as Rugby was imperative on account of a slight fog. Thence onwards there were no exceptional feats of speed, the "70" rate being only slightly topped at Castlethorpe, Boxmoor and Sudbury, but the principal feature was the lightning finish from Willesden, whereby the mile-a-minute rate was sustained right to Primrose Hill Tunnel, and the 5·4 miles into Euston were covered

TABLE C.

LONDON MIDLAND AND SCOTTISH (MIDLAND) RAILWAY. ST. PANCRAS—LEICESTER.

Distance.	Schedule.	1009 4 Shr. 27 167 175	†Speeds.	Engine No. .. ,, Type .. Load (axles) .. ,, (tons tare) .. ,, (tons full) ..	Distance.	Schedule.	718 3 Shr. 28 182 195	†Speeds.	Schedule.	767 3 Shr. 32 203 220	†Speeds.	1042 4 Shr. 25 160 170	†Speeds.
m. ch	min.	m. s.	m. p.h.		m. ch.	min.	m. s.	m. p.h.	min.	m. s.	m. p.h.	m. s	m.p.h.
0 00	0	0 00	—	St. Pancras ..	99 06	¶108	110 00	—	107	108 20	—	104 00	—
							Sigs.	stop					
1 43	4	4 10	—	Kentish Town ..	97 43	105	103 10	—	104	105 55	—	101 20	—
							Sigs.	sev.					
3 39	—	7 15	—	Finchley Road ..	95 47	—	100 30	—	—	103 30	—	98 50	—
							engine	ease	d.			engine	eased.
6 76	10	11 25	61½	Hendon	92 10	99	97 10	77½	98	98 50	—	95 00	—
		p.w.c.	5							p.w.c.	5		
9 28	—	16 40	—	Mill Hill	89 58	—	95 15	72½	—	94 55	—	93 10	77½
12 35	—	20 50	—	Elstree	86 51	—	92 30	60	—	91 55	52½	90 20	55
15 17	—	23 30	75	Radlett	83 69	—	90 05	80½	—	89 15	79	87 30	—
19 69	25	27 30	64½	St. Alban's ..	79 17	87	86 25	—	86	85 30	—	83 00	—
24 50	—	31 50	77½	Harpenden ..	74 36	—	82 05	—	—	81 00	—	78 55	—
27 21	—	33 55	72½	Chiltern Green ..	71 65	—	79 25	68	—	78 20	—	76 30	—
30 18	36	36 20	77½	Luton	68 68	77	76 45	—	76	75 20	—	72 50	—
												engine	eased.
32 61	—	38 30	69	Leagrave	66 25	—	74 10	43½	—	72 40	41	70 10	50
37 22	—	42 25	—	Harlington ..	61 64	—	68 15	—	—	66 10	—	64 40	—
40 18	—	44 35	79	Flitwick	58 68	—	64 45	55½	—	62 10	—	61 10	—
		engine	ease	d								sigs.	sev.
41 61	—	45 55	68	Ampthill	57 25	—	62 55	48½	—	60 10	41	58 45	55½
		sigs.											
49 68	54	53 30	68	Bedford	49 18	55	54 40	72½	54	51 15	72½	51 20	72½
52 78	—	56 30	—	Oakley	46 08	—	51 55	64½	—	48 35	70½	48 30	55
												engine	eased.
56 53	—	60 00	69	Sharnbrook ..	42 33	—	48 55	80½	—	45 40	80½	45 15	77½
59 60	65	63 45	44	Mile-post, 59¾ ..	39 26	45	45 50	42½	45	42 35	39	42 30	53
62 54	—	66 30	75	Irchester	36 32	—	42 10	—	—	38 50	—	39 30	—
		engine	ease	d.									
65 04	70	68 35	—	Wellingborough ..	34 02	38	39 55	—	38	36 40	72½	37 30	72½
69 27	—	72 40	67	Isham	29 59	—	36 05	—	—	33 20	80½	33 45	72½
72 01	77	75 25	*52½	Kettering	27 05	32	33 40	76½	32	31 20	82	31 15	67
75 47	—	79 10	55½	Glendon	23 39	—	30 45	—	—	28 30	—	28 20	77½
78 38	—	82 10	45½	Desborough N. Box	20 48	—	27 50	44	—	25 35	42	25 30	39
		sig.	stop										
82 75	90	90 30	—	Market Harborough	16 11	20	21 25	40	20	19 00	40	18 20	35
		sigs.	sev.										
86 26	—	95 15	—	East Langton ..	12 60	—	18 05	76½	—	15 50	76½	15 20	80½
89 54	—	99 05	46	Kibworth N. Box	9 32	—	14 55	48	—	12 45	50	12 30	50
91 44	—	101 00	66	Great Glen ..	7 42	—	12 45	—	—	10 45	—	10 30	60
		sigs.	sev.										
95 31	—	105 05	—	Wigston	3 55	—	7 50	—	—	6 20	—	6 25	—
		sigs.	sev.				sigs.	sev.					
99 06	109	110 45	—	Leicester	0 00	0	0 00	—	0	0 00	—	0 00	—

* At Glendon Junction, beyond Kettering.
† Maxima and minima by chronograph, at or near these stations.
¶ Public time-book, 110 min.

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in 6 min. 17 sec. Thus, 9½ min. of the lost time were regained, and the run of 112·9 miles was made in an actual time of 110 min. 25 sec., start-to-stop. On these three journeys, Driver Taylor achieved successive start-to-stop averages of 63·3, 64·0 (net), and 61·4 m.p.h.—a very notable record, and considerably above the average of pre-war performances. Again, on my own run in the last column, despite quite a modest exit from Coventry to Rugby and an over-cautious slack through that station, the start-to-stop time from Coventry to the signal stop at mile-post 6½, 87 miles 37 chains, was 84 min. 15 sec., which equals a start-to-stop average of 62·3 m.p.h.

We now pass on to four journeys on the Midland section of the London Midland and Scottish Railway, two of them "featuring" that fine Kentish Town driver—C. Bryant—working on the up journey a superheated 4-4-0 engine (No. 718) which was in his temporary charge, and on the down journey his own 4-4-0 compound (No. 1009) now also superheated. The latter trip was, over certain sections of the journey, the most astonishing Midland run I have ever made, shattering every record I possess on that line; and I would add that no previous communication had been made to the driver on either of the two journeys. Taking first the down journey—made on the midday "Scotsman"—the reader will see that nothing exceptional was attempted until we were past the exceedingly severe slack over the Tube extension works just beyond Hendon. But from Elstree onwards we fairly flew. Just look at the speeds—75 m.p.h. at Radlett; 64½ beyond St. Albans, *after climbing for* 4½ *miles at* 1 *in* 177; 77½ at the bridge over the River Lea just beyond Harpenden, approached by nothing steeper than 1¼ miles at 1 in 206–182; 72½ minimum beyond Chiltern Green, and 77½ again through Luton; and finally 69 *minimum* before commencing the long descent to Bedford! Nothing even approaching such times in this direction of running has ever previously figured in my note-books; in fact, a time of 17 min. 40 sec. for the 20 miles, 26 chains from Elstree to Leagrave, with its average of 69 m.p.h., seems to me quite unique over a length of line so markedly against the engine as is this. Suffice it to say that on two subsequent trips I have made with the same train, and with identical loads, superheated class "3" engines required 21 min. 35 sec., and 21 min. 55 sec. for the same distance.

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*Henry L. Salmon.*

South express from Glasgow (St. Enoch) passing Strathbungo.
Glasgow and South Western 4-6-0 locomotive No. 511.

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After so magnificent a recovery from Hendon slack, we might with perfect ease have got through Bedford in 52 min., or 49 min. net—under "even time"—but beyond Flitwick the engine was eased, as we were getting ahead of time, and, further, were slowed by adverse signals beyond Ampthill Tunnel. Beyond Bedford, however, we got going again in great style, reaching no less than 69 m.p.h. on the one-mile "dip" beyond Oakley troughs, and mounting the mile at 1 in 180 and 3¾ at 1 in 119 to Sharnbrook Summit at a minimum of 44 m.p.h. Better still was the performance after our easing from 75 to 60 m.p.h. through Wellingborough, as we worked up to 67 m.p.h. on the slight rise to Isham, and then went up the 4¾-mile ascent to Glendon Junction, steepening from 1 in 218 to 1 in 118, at a minimum of 52½ m.p.h. The subsequent 3 miles at 1 in 132 from Glendon to Desborough North Box did not bring us below 45½ m.p.h. After that a succession of signal checks ruined the remainder of the run. It is impossible to estimate a net time for the journey, but time was being gained handsomely over all unobstructed lengths of line, and Bryant would probably have experienced little difficulty in working his 175-ton train to Leicester in 100 min., or even less.

Coming up, too, he did extremely well with No. 718, on the Manchester express nominally due in St. Pancras at 1.45 p.m., but actually at 1.43 p.m. Two minutes "down" at Wellingborough, in consequence of the initial signal check, he was on time through Bedford, as a result of fine climbing to Sharnbrook Summit, with a minimum of 42½ m.p.h. up 4 miles concluding with 2¾ at 1 in 120, and a smart descent to Bedford, on which the speed slightly exceeded 80 m.p.h. In fact, time was gained practically all the way from Wellingborough to Hendon, to the tune of 3¾ min., and we might have rolled into St. Pancras comfortably in the pre-war time of 105 min.—despite the Wigston slack—but for adverse signals from Finchley Road onwards. Net time from Leicester to London was 103 min., or 5 min. inside the schedule of this train.

I do not know the name of the driver on the next journey, but he made some fine running with the same type of engine and a rather heavier train of 220 tons, on the 2.33 p.m. out of Leicester. Time was gained consistently from the start as far as Bedford, which was passed in 51¼ min. from Leicester, 2¾ min. early. But this was the prelude to a leisurely ascent from Bedford to Luton, on which we dropped 2 min. out of the time previously

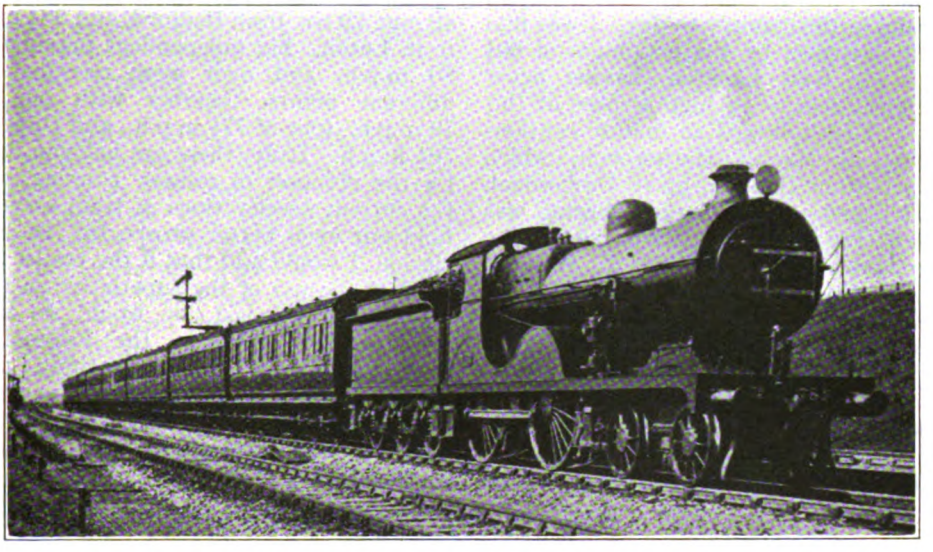

Photo.] SOUTHERN RAILWAY. [*F. E. Mackay.*

Down London-Dover Express. South Eastern & Chatham 4-4-0 locomotive No. 781.

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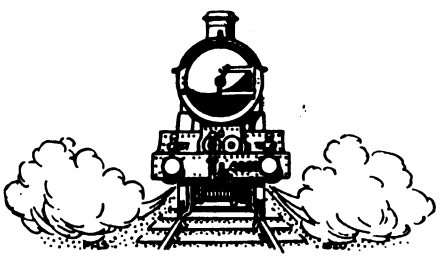
gained. The ascent of Irchester Bank was also inferior to that of No. 718, but the Kettering-Wellingborough time, on the other hand, was, with its maximum of 82 m.p.h., one of the fastest, if not the fastest, I have ever recorded between these points. It was a pity the driver eased his engine so markedly up to Luton, as thereby he left nothing in hand from the Hendon slack, and we were slightly behind time on arrival in consequence. But the net time up from Leicester was not more than 105½ min.

In the last column there appears another extraordinary journey with one of the superheated compounds—surely amongst the most efficient engines, for their weight, running in the country to-day. I was first of all electrified by the maximum of 80½ m.p.h. at East Langton, having never previously reached so high a speed at this point. Then followed an unduly cautious slowing at Market Harborough, which hampered our climbing up to Desborough North; and a very marked slowing was also effected through Kettering, so that we were barely ahead of time at Wellingborough. But look at the amazing climb to Sharnbrook Summit, with its minimum of 53 m.p.h. on 1 in 120, and its gain of 2¼ min. in just over 5 miles! Then another easing of the engine; following that a striking effort from Bedford up to Ampthill, with 55 m.p.h. well sustained up a grade of 1 in 200 continuously; and an *acceleration* up the corresponding grade past Harlington, after the signal check, to 50 m.p.h. at the summit. After that there had to follow a series of easings of the engine, to avoid extravagant gains on schedule, and even so the train was 3 min. ahead of time on arrival. What we might have completed the journey in, given a late start and a clear road, is a pure speculation, but I am prepared to guarantee that 95 min. would have been a possible time for the 99 miles' journey.

The best point-to-point times out of these three runs, added together, actually make a total of 98 min. 20 sec. from Leicester to St. Pancras, intermediate times being 68 min. up from Kettering, 49 min. 20 sec. from Bedford, and 38½ min. from Luton. Six independent maxima of 80 m.p.h. and over were recorded at different points, together with one of 79 m.p.h., four of 77½ m.p.h., and three of 76½ m.p.h. Truly, these are halcyon days for the observer of railway running, and the current accelerations of train services hold out even better prospects. In conclusion, I would add that if the reader has tired of the use of the superlative in this article and the last, he would do well to remember that, in the locomotive developments of to-day, entirely new standards are being set of efficiency in design, which are expressing themselves, logically and proportionately, in new standards of performance.



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Some Features of French Railway Signalling.

By C. H. PALMER, B.A.

(Illustrations supplied by T. S. Lascelles and the Eastern Railway of France.)

ARTICLES have appeared from time to time in various English publications as to the meaning of French signals, but little attention has been paid to the block working side of French signalling; even Lord Monkswell, in his otherwise brilliant essay on French Railways, dismisses the whole question in a couple of pages, and explains the signals very cursorily, while he does not go into the question of block working at all, beyond implying that it is universal in France.

As a matter of fact, block working is by no means universal. From some statistics furnished by the Orleans Company, I find that there are still 225 km. of double track where the trains follow each other at time intervals, while on the Eastern Railway the proportion of line worked on the time system is even higher. From a working time-table kindly supplied by the engineer's department of the Eastern Railway, it would appear that (excluding certain lines in the invaded areas which were not, in December, 1919, the date of the time-table, restored to normal working) there were 1,680 km. worked by the block system and 1,624 km. by time. This refers to double track only; that is to say, that 49 per cent. of double track is worked on the time interval system on the Eastern Railway!

The normal time that must elapse before one train follows another on such lines is 10 minutes. An exception is made in the case of a stopping train following an express, or a goods train following a passenger train, when the time can be reduced to five minutes; and in a few exceptional cases it can be reduced to two minutes even, but these cases are rare and are confined to short sections of line, as between a station and a junction a few kilometres off, where the trains will take different routes.

On all French lines, except the Western, where block working is in force, the entry to each section is protected by a semaphore; the semaphores are put up to supplement the ordinary signals, but do not supplant them. They may be passed at danger by trains shunting in stations and relate only to the block working. Only on the Paris-Lyons-Mediterranean are semaphores used for purposes other than the block.

Dealing first with the Lartigue system of block working, Fig. 1 shows a semaphore post fitted with two arms, a' and a'', one for each direction. The arm to the left, a', is at danger, while a'' for the opposite direction is in the clear position. There are also two small arms, b' and b''; these do not concern the drivers, but repeat the large arms at the next post, and are for the benefit of the signalman only. In the normal or free position the large arm hangs down vertically at clear; it is only locked in the horizontal danger position when a train is actually in the section. The small arm, on the other hand, when locked hangs downwards, *i.e.*, the large arm at the preceding post is in the clear position. When free a counterweight drops and raises it to the horizontal position, *i.e.*, the large arm at the preceding post is at danger. Every time that the large arm is unlocked and falls to the clear position, the bell C is rung by means of the lever Q attached to the signal rod T; when the small arm takes the horizontal position the same bell is rung by the lever Q. The arms are worked by handles M, fitted to the instruments at the bottom of the post. The handles for the large and small arms are shown for one direction only, those for the other direction being on the other side of the post. The handle of instrument No. 1 works the large arm, that of No. 2 the small arm.

Let us suppose that there are three block posts A, B and C, and a train is to travel from A to C. The line is clear all the way and the signals are all in the "Off" position. When the train leaves A the

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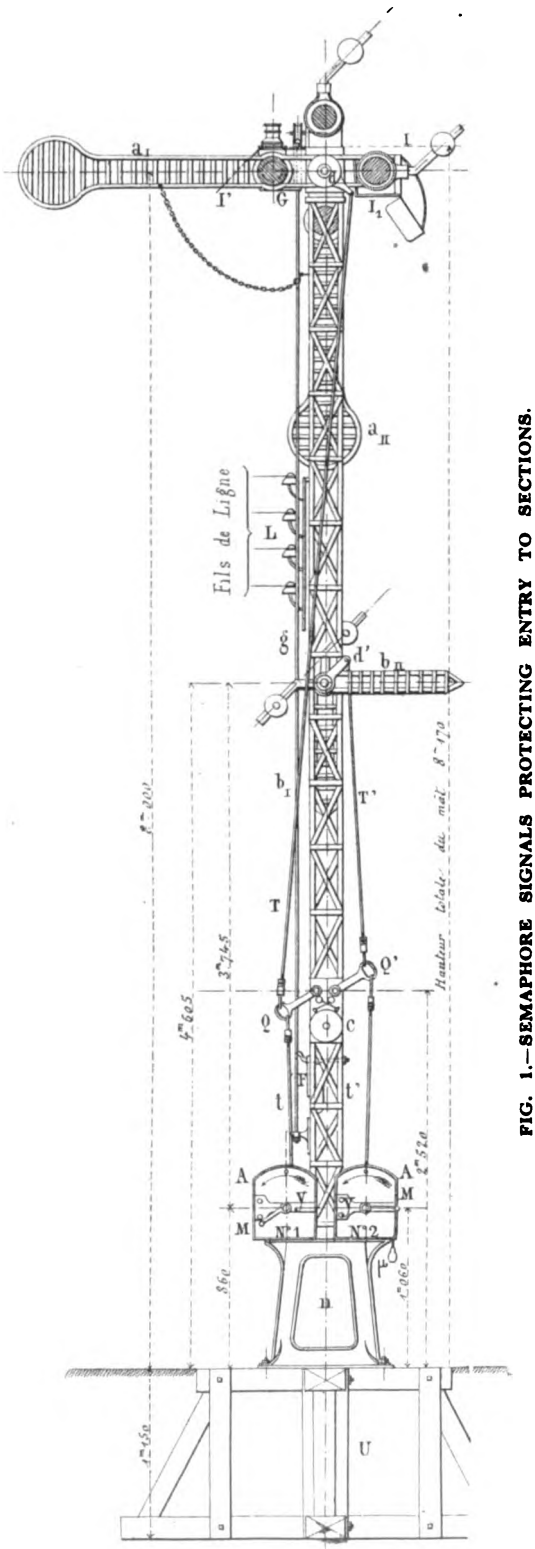

FIG. 1.—SEMAPHORE SIGNALS PROTECTING ENTRY TO SECTIONS.
Small signals to right are for the information of signalmen.

signalman there turns his No. 1 handle from right to left causing the large arm to go to danger, in which position it is locked; at the same time an electric current is passed along the line wire to B and unlocks the small arm there, causing it to change from the vertical to the horizontal position, the bell C ringing at the same time. The signalman at B is thus advised by the ringing of the bell and by the small arm taking the horizontal position that a train has entered the section AB. When the train passes B the signalman turns his No. 1 handle, causing his semaphore to go to danger as well as the small arm at C; he then gives "out of section" (after assuring himself that the train is intact) by turning his No. 2 handle. This makes his small arm take the vertical position and locks it there, at the same time passing a current back to A, which unlocks A's large arm, so that it drops to the clear position; the bell rings at the same time and A knows that the section is clear. In the same way when the train reaches C the signalman gives out of section to B and the semaphore at B drops. Recently the system has been improved by the addition of electric treadles. Until the train has operated the treadle, the rear section cannot be cleared (as with an English lock and block system). It should be noticed that the line is normally clear except when a train is actually in occupation of a section, and the signalman does not have to obtain "Line clear," as in this country.

Originally, on the Eastern Railway the instruments had card indicators which had two positions: "Voie libre en avant" and "Train annoncé" for the No. 1 instruments and the same "en arriére" for the No. 2 instruments. These were considered superfluous and do not exist now. In the new design now in use, on turning the handle of an instrument from right to left the arm is locked and cannot be moved

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by the signalman at that post, as the shaft rests on a stop bar. When, however, a negative current is passed from the next post through a Hughes electro-magnet, the armature is momentarily freed, which actuates two springs, so that the stop and bar move and the shaft drops, thus unlocking the semaphore. In the case of the large arm it will drop to the clear position; in the case of the small arm the counter-weight will drop so that the arm itself will take the horizontal position.

The handle must always be moved from right to left, and when in the position on the left swings round to the position on the right of itself every time an unlocking takes place, always moving in the contra-clockwise direction; a pawl prevents it from being moved clockwise. By means of this pawl and an electromagnet various interlocking arrangements are made with the distant signals (red discs or green and white draught board signals).

The Lartigue system is used on the Northern and Eastern Railways, and on the Orleans Railway in a modified form. The engineers of this line feared that lightning might cause the semaphore to be unlocked and therefore use a constant positive current to keep it in the locked position; when this current ceases the semaphore is unlocked. It should, however, be pointed out that the Northern and Eastern Companies have never had an accident from lightning and that the system of momentary currents works quite satisfactorily. Another peculiarity is that the Orleans Company alone uses an *absolute* block system; on the other systems *permissive* block working is the rule.

Permissive working on the Eastern and Northern Railways is as follows. When a train has entered a section no other train may enter until a certain time has elapsed, usually five minutes, in certain cases two minutes. The signalman gives the guard a ticket, which is shown to the driver, who signs it, and the train travels at a reduced speed and must stop at the next signal ahead, *even if it be "Off,"* till a verbal order is given by the signalman to proceed. The signalman books every train that enters a section already occupied, and when his semaphore drops through the action of the signalman ahead, the first train having cleared the section, he must immediately put it to danger again, for

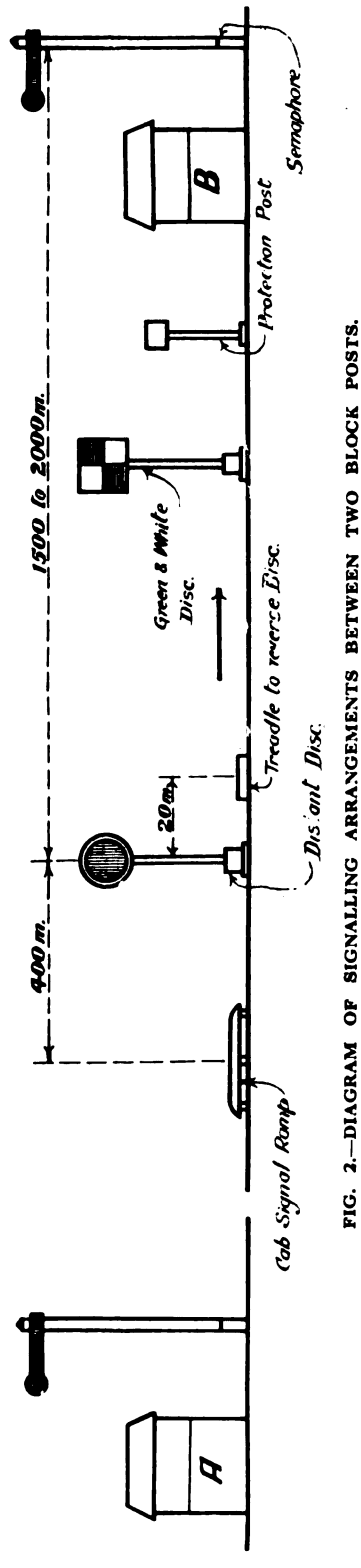

FIG. 2.—DIAGRAM OF SIGNALLING ARRANGEMENTS BETWEEN TWO BLOCK POSTS.

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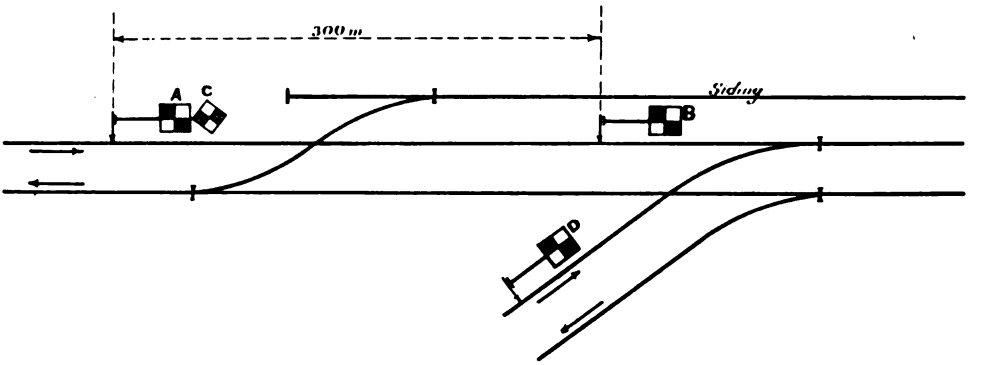

FIG. 3.—DRAUGHTBOARD SIGNALS AT A JUNCTION.

the second train is still in the section. He may allow an unlimited number of trains into a section in this way, putting his semaphore to danger each time that it drops as many times as there are trains in the section.

A special and rather curious rule exists on the Grand Ceinture line between Paris and Vincennes: a train entering a section already occupied must travel at a walking pace preceded by the guard carrying a red flag or lantern. On sections in which there are tunnels more than a kilometre long, if straight, or 600 metres, if including a curve, the time between trains following each other under the permissive working rules is increased to ten minutes. And on lines worked by the time system, time working is suspended altogether; line clear must be obtained by telegraph (the words being spelt out in full) between the stations at each end of the tunnel. In some cases special instruments are provided.

The Southern and the Western Railways use the Regnault two-position needle block system. On a train entering a section the signalman plunges, causing his needle to change from the upright "Line clear" position to the inclined "Line blocked" position, deflecting the needle in the next box in the same way and ringing a bell there. On the train arriving at this box, the signalman depresses another plunger, putting his needle back to "Line clear" as well as that at the entry of the section, and the section is now clear. The original instruments have been converted into a kind of lock-and-block working; a signalman cannot give "Line clear" till he has put his signal to danger behind the train, nor can he pull off his signal until his needle has been put back to the clear position. A constant current is used to keep the needle deflected in the "Line blocked" position and two line wires are required, one for each direction.

A peculiarity of this railway is that instead of semaphores being used at the entry of each block section, red and white draught board signals are used. These face the train when at danger, and drop when in the clear position. But behind the board there is a second one bearing the word "Attention." The signalman puts the signal to danger behind the train, and no train may enter the section for five minutes. After that time has elapsed a train may enter on receiving a written permit from the signalman (as described for the Eastern Railway); at the end of another five minutes, if the section is still blocked, the signalman lowers the front board leaving visible the board with the word "Attention." Trains may now enter the section without a permit, but the drivers are warned by the "Attention" board to be careful. The signalman cannot lower the "Attention" board till he has received "Out of section" from the next box.

The Paris-Lyons-Mediterranean Railway use a modified form of Tyer's one-wire two-position-block system. Originally it was practically the same as that used in this country. It has now been modified so that a signalman cannot pull off his semaphore till the signalman at the next box has given "Line clear," nor can a signalman give "Out of section" till he

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has put his signal to danger behind the train. It is, further, combined with the Jousselin bell and train describer for announcing the departure of trains from box to box and sending other messages. The plunger of the Tyer's instrument works the Jousselin bell, which at the receiving station consists of an electric bell and a dial, round which there are numbers each of which stands for some message, *e.g.*, No. 1 means "Line clear"; other messages are given according to the number: "Passenger train on line," "Goods ditto," "Stop and examine train," "Train broken down in section," &c. The normal position of the block indicators is at "Voie libre," but the semaphores are kept at danger till a train is expected; card indicators replace the needle indicators usually seen in Tyer's instruments.

When a train is signalled on the Jousselin describer from the preceding post, the signalman pulls off his semaphore, if the indicator shows "Line clear." When the train passes, he puts the semaphore to danger behind it; this automatically changes his block indicator from "Voie libre" to "Voie occupée" as well as that in the next post. He then announces the train to the next post on the Jousselin describer to advise the signalman ahead what type of train to expect. He then gives back to the preceding post the "Voie libre," which he cannot do until he has put back the signal to danger behind the train. Also, he cannot pull off the semaphore till the train has reached the next post and the signalman there has given back "Voie libre." Permissive block working is very strictly controlled on the Paris-Lyons-Mediterranean, and is only allowed in emergencies. If, after a certain time, a signalman has not received "Line clear" (the time varies according to the length of the section), he may ask on his Jousselin apparatus if the train that has entered the section has passed the next box. If he receives a negative reply he may allow a second train to enter the section, giving both the driver and the guard a written permit, and the train must travel at a reduced speed. He may only let a third train enter the section in the case of a breakdown. He does not announce the second train when it actually enters the section, but waits till he has received "Line clear" for the first train. He then pulls off his semaphore and puts it to danger immediately and announces the train on the Jousselin describer. A releasing key is provided to unlock the block instruments when required, but stringent regulations are made to prevent improper usage.

The signalling arrangements between two block posts are shown in Fig. 2. The semaphore is always preceded by a red disc and its "limit protection" post, except on the Orleans Railway; very often by a green and white draught board signal as well. The latter is merely a repeater for the semaphore. When it exists the meaning of the disc at danger is "Train standing at the semaphore," a situation that might easily arise where there is permissive working. In this case the disc is put to danger immediately the train passes it (usually automatically by the treadle shown in the diagram, or a bell may be actuated in the signal cabin) and is pulled off again as soon as the semaphore is put to danger behind the train. In cases where there is no green and white signal, the disc is a repeater for the

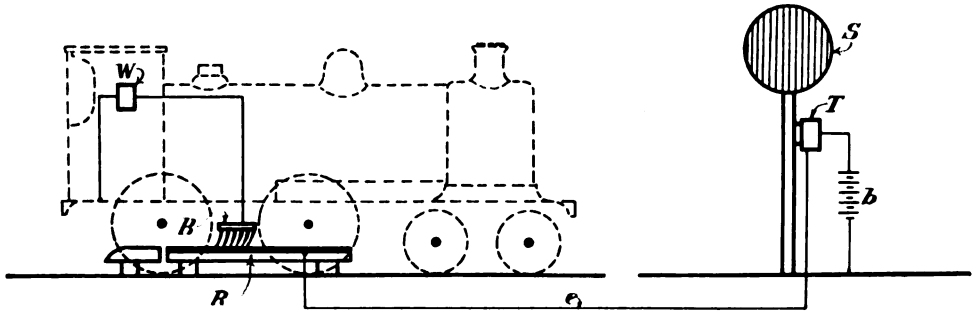

FIG. 4.—LARTIGUE CAB-SIGNALLING RAMP.

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semaphore as well, and is not put to the clear position as long as the semaphore remains at danger. When a train is stopped at a semaphore the guard must see that the rear vehicle is standing inside the "limit protection" post; otherwise he must protect his train with detonators. A driver passing a disc at danger must immediately reduce his speed and be ready to stop if he sees a train in front of him, and in any case stop at the signal which the disc covers, *even if in the clear position*, and wait orders from the signalman or guard. The Orleans Company use no red discs at all, only the green and white distant signals.

The disc and green and white signals are used in the same way with the red and white draught board signal (A and B, Fig. 3), which commands a complete stop. On the Western line this signal is used at the entry of block sections instead of the semaphore, but on other lines it is only so used where the sections are very short, *e.g.*, on the Paris suburban lines and at large stations. Its usual function is to protect points, stations, &c.; or as a starting signal on lines worked by the time system. It should be noted that when the green and white signal is less than a kilometre from the signal that it repeats it stands up diagonally (as at C in Fig. 3).

Quite small stations are often protected by the disc alone. In this case, if a train encounters a disc at danger, it must immediately reduce speed and be prepared to stop short of any obstacle, and in no case pass the station without receiving orders from the man in charge. This working happens very often at stations where the time interval system is employed.

The Northern Railway have installed practically with every disc a Lartigue cab-signalling ramp. Fig. 4 shows the principle. If the disc be at danger the ramp (usually known in France as the "crocodile") is fixed in the four-foot way about 400 metres in front of the disc S. This ramp R is connected by the cable *e* to a battery *b* close to the signal post through a switch T which is closed when the disc is at danger. The engine is fitted with a brush B made of copper wires, which picks up the current on coming into contact with the ramp. Fig. 5 shows the engine apparatus. When the current is picked up from the brush through the

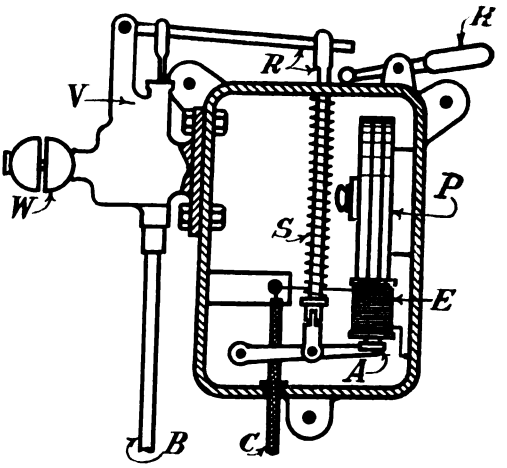

FIG. 5.—ELECTRO-MAGNETIC WHISTLE, USED FOR CAB-SIGNALLING, C. DE F. DU NORD.

insulated cable C, the armature A of the electromagnet E is forced away by the spring S; the valve V is opened and steam is admitted through the pipe B and blows the whistle W until the driver resets it with the handle H. When the disc is off the battery is connected and no signal is given. This is the weakness of the system, for the battery might be disconnected by accident. For this reason it has not been adopted outside France, but it can claim to be the oldest cab-signalling system on record, having been introduced in 1872. On the Northern Railway a graphic record of the discs met with at danger is kept, while on the Eastern Railway signals are recorded whether at danger or clear. On the Paris-Lyons-Mediterranean the battery is placed on the engine.

Other signals are the green disc signal prescribing a reduction in speed, and the blue fish-tail semaphore signals protecting junction facing points, besides the warning boards (inscribed "Bifur" or Y-shaped) that precede a junction. But lack of space prevents detailed explanation. At night a white light denotes clear, while the night danger signals are red disc, one red light; red and white signal, two red lights; green and white signal, two green lights; green disc, one green light; semaphore, one green and one red light; and junction signals, violet.

Single line working is not very far advanced in France, except on the Nord.

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A few attempts have been made to adapt the existing block systems to single line working, but not much progress has been made. A wooden staff (*baton pilote*) is carried on lines worked by one engine in steam, but staff working has not progressed beyond this, except on the Midi, where a novel form of electric staff has been tried. Contrary to the Webb and Thomson system, the electric current locks the staff, while the absence of the current releases it! Comment on this system (the Chassin system) would be superfluous. A strict system of rules is usually drawn up by each company for the obtaining of line clear by telegraph, and on most lines a big electric bell, ringing like the chimes of a church bell, is used to signal the departure of trains from station to station. On the Northern Railway the bells are used on double lines as well. The rules for the despatch of trains are very strict, especially if a departure is made from the time-table, as to the crossing-place of two trains.

The Northern Railway very extensively throughout its system (other railways in special places) have adapted the Lartigue block for single line working. Each post has for either direction, in addition to the semaphores, a commutator and two indicators, one " train to," normally, showing white, and the other " train from," red. The large arms remain normally *at danger*, but can be lowered by either post taking the initiative. The small arms are normally lowered. Suppose A wishes to send a train to B. The signalman operates the commutator, causing his large arm to drop to the " clear " position and his " train to " indicator becomes red, while at B the large arm is locked at danger (preventing a train entering the section in the opposite direction), while B's small arm flies to horizontal and his " train from " indicator becomes white. When the train leaves, A puts his large arm to danger, with the No. 1 handle, and B's " train from " indicator becomes red again. When the train reaches B, the signalman there operates the No. 2 handle (which for greater security he must first unlock with a key), his small arms drop and A's " train to " indicator becomes white again. Either post may now despatch another train. The section may further be subdivided by any number of block posts which are not crossing places; this complicates matters, but the principles of working remain the same. All single line block working is *absolute*.

This article does not pretend to be complete and there are many points omitted for lack of space. The " MDM (*Minimum de Manoeuvres*) " system of interlocking enables the signalman to select any specific route and pull off all the points and signals for it with one lever. It is used notably in the vicinity of the Gare du Nord at Paris. The treadle " Aubine block " is sometimes used for suburban working. In this case, when a train passes the signal of a block post, it passes over an Aubine treadle, automatically putting the signal to danger. The signalman must then return the lever, which, *if put right back home*, is locked, and can only be freed when the train has reached the post ahead and the signalman there has operated a lever. The weakness of the system is that the lever can be put nearly all the way back without being locked, and if this happens it can be pulled off again at once and the signal operated for the admission of another train into the section. The recent fatal accident in the Batignolles tunnel has been attributed to this cause. The Eastern Railway has recently installed a new track circuit automatic block. At stations the working is semi-automatic with red discs; between stations it is completely automatic, with a new type of semaphore painted red with two white stripes. If the latter signal is encountered at danger, the train may proceed " prudently " (after the guard has given the driver a ticket), but the train must first wait three minutes at the signal. This was first tried during the war to expedite trains going up to the front, but the idea is now to install it on the Paris-Strasbourg Line, at any rate as far as the old German frontier station of Avricourt. From there to Strasbourg is the Alsace-Lorraine system (till 1918 German property) on which the German Siemens alternating current lock-and-block functions, and it is doubtful whether any French form of signalling could be operated profitably in Alsace. The German station interlocking operates on a track route-lever system, but it is quite different from the MDM.

I cannot say that I am a great admirer of French signalling practice. The permis-

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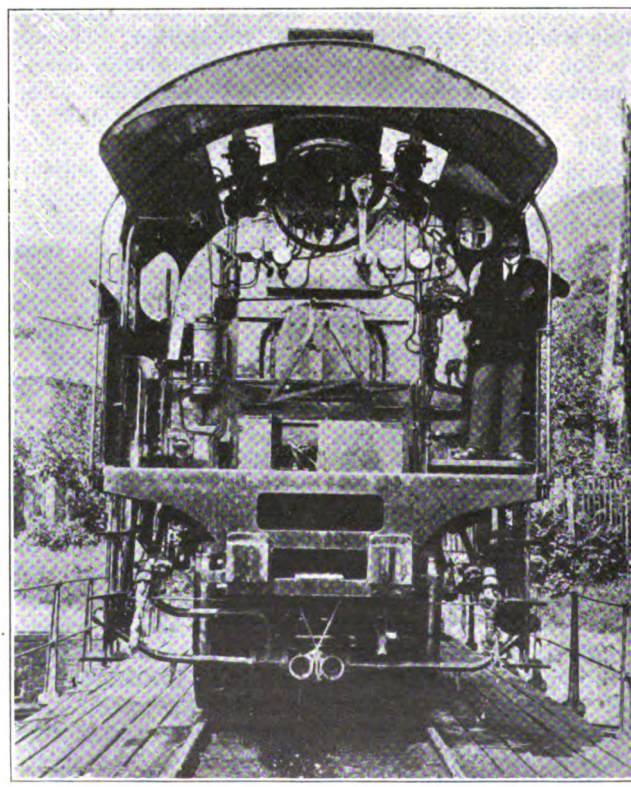
sive working does not seem to me to be altogether desirable; further, the great number of signals must lead to complications, and the draught board and disc signals seem old-fashioned to English ideas. It is interesting to note, however, that the Germans erected a number of their own pattern semaphores in place of the red and white draughtboards on the lines of the Eastern Railway occupied by them during the war; yet the Eastern Company are returning to their own signalling and so evidently find the draught board signals satisfactory. Other objections are the use of white lights for "clear" at night, the absence of proper interlocking at even important stations, and the slovenly and dirty upkeep of boxes and apparatus. What makes French signalling really so bad is that any failure brings all signals and lights to "allright," contrary to our practice where they all go to danger in the event of a breakdown. An interesting point about French signalling that struck me while inspecting the signal boxes at Pontarlier (P.L.M.) was the fact that the exact position of each signal was repeated by electric repeaters in the box so that the signalman could always see whether they were in the danger or clear position; I gather that this practice is universal.

In conclusion, I must thank the engineering department of the Orleans and Nord Railways; Monsieur Mauris, of Dijon, and the stationmasters at Pontarlier for the Paris-Lyons-Mediterranean, and especially Monsieur Descubes and his assistant, Monsieur Héry, of the Eastern Railway; these two latter gentlemen took a great interest in all my questions and provided very material assistance with books and diagrams.

IN THE CAB OF A HUNGARIAN LOCOMOTIVE.



VIEW OF FOOTPLATE AND FITTINGS, 4-6-0 LOCOMOTIVE.

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NEW SUBURBAN ROLLING-STOCK, NEW SOUTH WALES GOVERNMENT RAILWAYS.

IN anticipation of the electrification of the Sydney suburban lines on the New South Wales Government Railways, and in order to meet the continuous increase in the suburban passenger traffic, it was decided by the Railway Commissioners to build additional rolling-stock suitable for both conditions. It was also decided that the stock should be built to the full width of the new standard gauge, viz., 10 ft. 6 in. The cars are provided with sliding doors, except that in the guard's compartment swing doors are provided. All seats are arranged transversely. Some of the seats will each accommodate three passengers, the remainder each accommodating two passengers; the width of the cars is sufficient to allow five passengers to be comfortably seated across the cars without reducing the ordinary width of the centre passage-way.

Each terminal car will seat 82 passengers and each intermediate car will seat 90 passengers. Several of the seats in the doorways are hinged so that they can be raised during the rush-hours of traffic. The cars are to be assembled in trains of four and six cars in steam service.

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New Train Control Apparatus at York, London & North Eastern Railway.

TRAIN control systems have been in operation on sections of the late North Eastern Railway for many years, in particular, at Middlesbrough (Newport), and in the Tyneside district. A new installation, including special and novel features, was brought into use in November last at York. This covers all main line traffic, both freight and passenger.

One of the special features of any control system is the means by which the trains are "followed" on their journeys, and the considerable divergence of practice and opinion in the matter of diagram boards is reflected in the wide disparity between the methods adopted on various railways. The York control introduces quite a new departure in diagram boards, owing to the clockwork arrangement which enables the carriers, representing the trains, as they arrive in the control area to be attached to one of ten cords, which move along the board on the "endless belt" principle at a geared speed according to the scheduled working of the various classes of trains. By this means a visual indication of the approximate position of each train in the control area is afforded at any time. Certain other refinements on existing train control practice have also been introduced in the York main line control office.

At present the control is, to a certain extent, experimental, but it is intended that ultimately it will permit of supervision of all passenger and freight trains passing between Shaftholme Junction and Newcastle (Central) station, except that the Newcastle Traffic Control Office will supervise freight trains between Low Fell and Newcastle.

Principal stations on the route are shown on the diagram board in big letters, and between them are given the names of station and junction signal-boxes which act as reporting places. Under each station are shown "independent" lines, sidings, branch lines, etc., on to which trains may pass from the main line. Trains are reported as they travel along and, on the ordinary control board, their corresponding carriers are placed by the control staff opposite to the point from which the trains were last reported, and are transferred from point to point as necessary, so that a glance at the board shows the condition of the line. But the York control board is a new and very ingenious arrangement which undoubtedly adds to the usefulness of the board and certainly adds to its interest.

Following the 10 black lines seen in the photograph (5 at the top and 5 at the bottom) are 10 cords, which are run by clockwork on the "endless belt" principle at varying speeds corresponding, as far as possible, with the varying speeds of the trains which pass along the line ("express passenger," "intermediate express," and class "A," "B" and "C" freight trains. Each "train," represented by its carrier as it comes into the control, is put on to its appropriate cord and travels along at geared speed, so that, theoretically at any rate, the carrier at all times indicates the position of the train. The board, which shows the position of every signal-box and station, is drawn to a time scale, instead of a distance scale, and shows running time in minutes between signal-boxes. Thus, the scale was based on running times sometimes differing in opposite directions, which therefore have varying scales. The up and down belts (four each) are, in fact, driven independently by two standard electric clocks through variable pulleys, adjusted to give the desired speeds in each set. Any subsequent adjustment in running speeds can be made by altering the variable pulley concerned, though, obviously, this adjustment must apply from end to end, local variations being provided for by altering the distances between the reporting points.

The lists seen on the upper part of the board contain details of every booked passenger train, showing its number in the working time-table, and its timing from point to point, and also the occupation time for the various classes of freight

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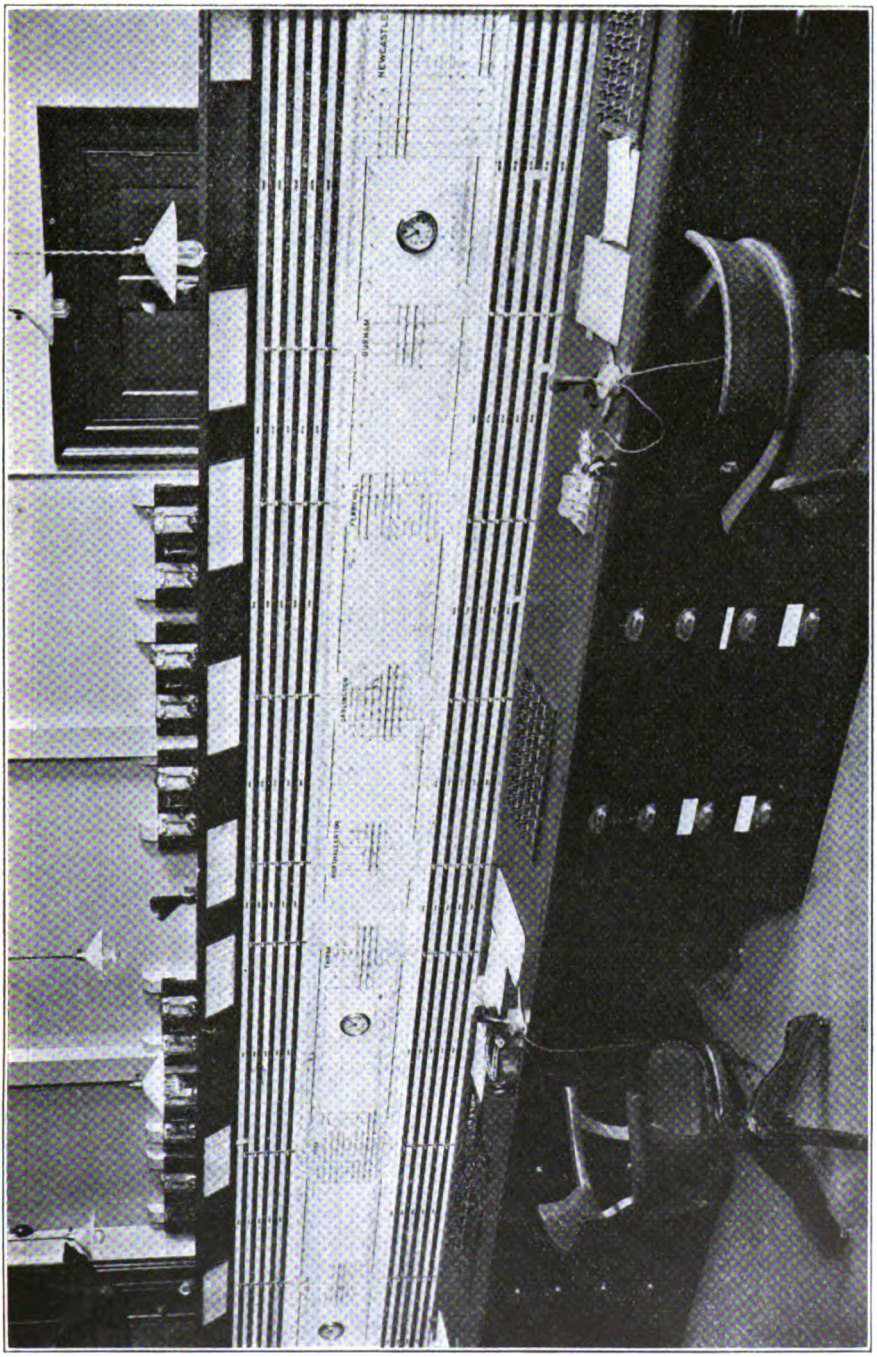

MAIN LINE CONTROL BOARD, YORK.

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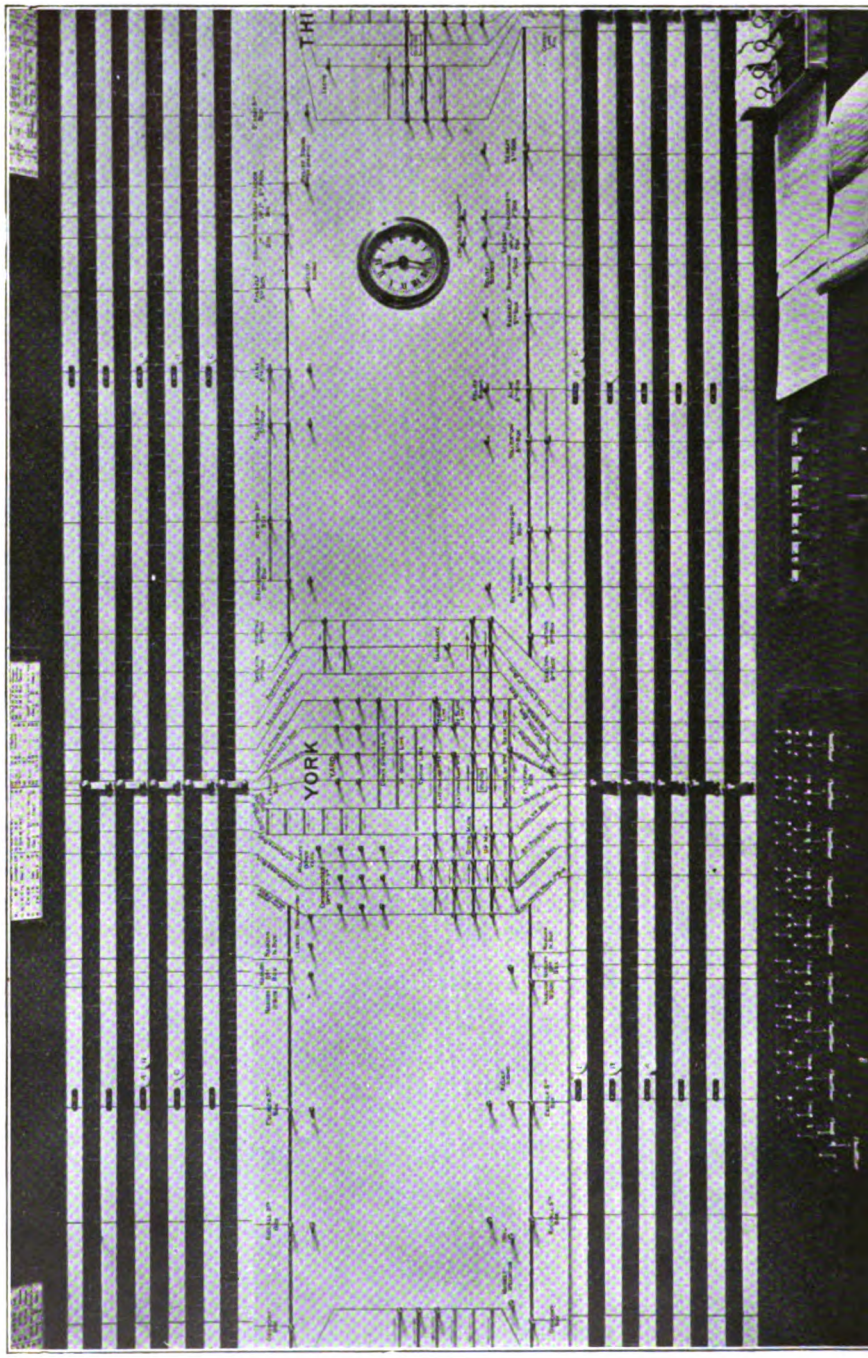

MAIN LINE CONTROL BOARD (ENLARGED SECTION).

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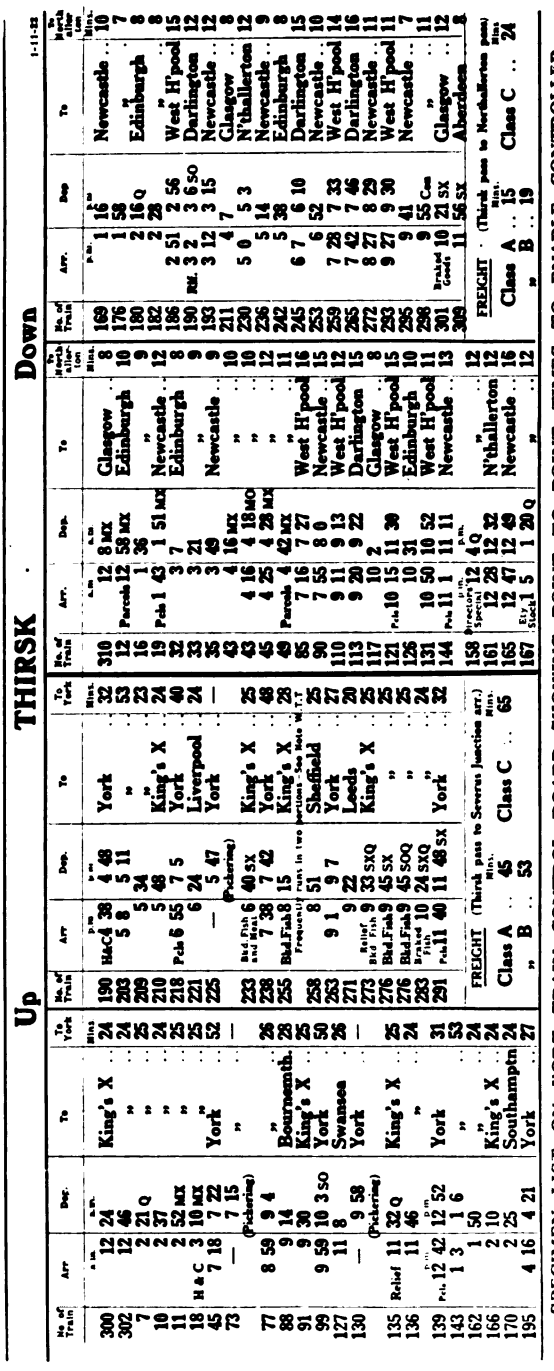
trains, so that the controller has no difficulty in deciding on to which cord the carrier should be fixed, the speed of the cord as between each pair of places being indicated on the board.

At intervals, which coincide with the various stations where there are reporting points, brass stops are fitted on the board to prevent the carrier getting past the reporting place before the train is actually reported and the brass stop or lever actually released by the controller. Consequently, if a train is running slower than the speed of the cord it will be checked by this automatic stop. Similarly, if a train is actually travelling at a greater speed than the cord, the controller's attention is immediately drawn to this, when the report is received and the carrier is moved along for a new start.

In addition to the actual supervision and control of train-running, the control is also in direct communication on three circuits (separate from those used for train reporting) with the yardmasters, stationmasters, &c., at the principal yards and stations in the area, also the Newport and Newcastle controls, and the various district superintendent's offices. It is thus in a position to co-ordinate the working between various points in regard to running of specials, cancellation of trains and utilising of unbalanced engines which would otherwise have to run light.

There are six main circuits of telephones operated on the Western Electric "selector" principle. The control staff work in three shifts, the office being open continually, weekday and Sunday. Each shift consists of a deputy chief controller, two controllers and three assistant controllers.



SPECIMEN LIST ON YORK TRAIN CONTROL BOARD SHOWING POINT TO POINT TIMES TO ENABLE CONTROLLER TO SELECT CORRECT CORD FOR CARRIER.

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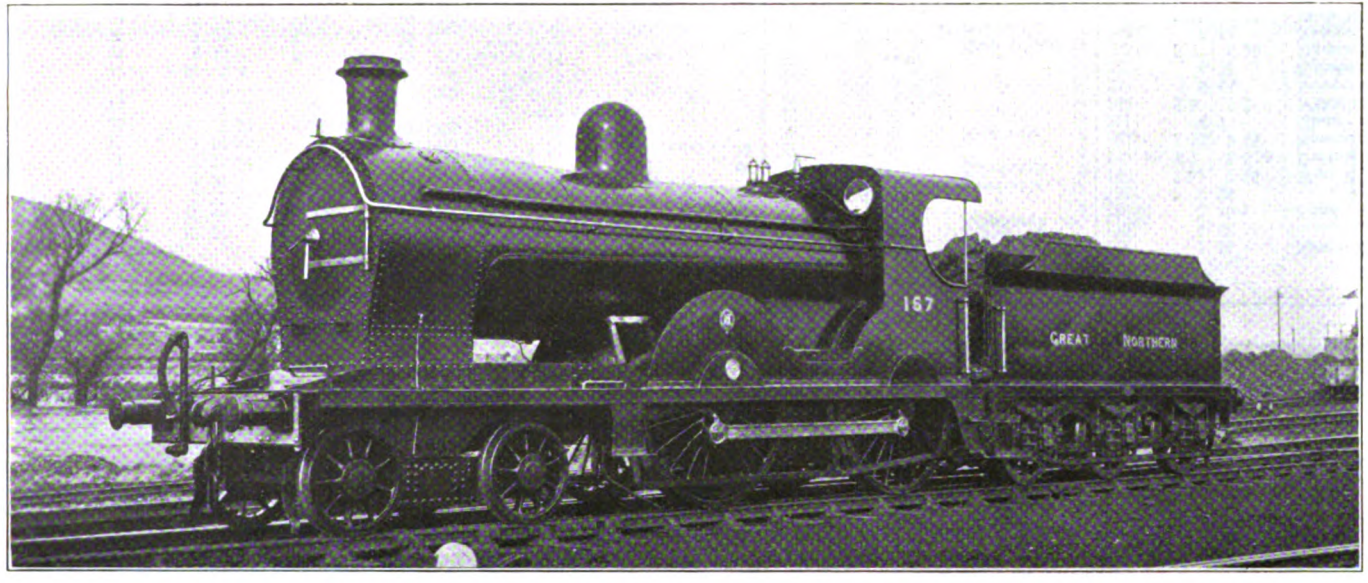
REBUILT SUPERHEATED 4-4-0 LOCOMOTIVE, GREAT NORTHERN RAILWAY (IRELAND).

MR. G. T. GLOVER, M.Inst.C.E. Locomotive Engineer.



A number of earlier 4-4-0 and 0-6-0 locomotives have been rebuilt by MR. GLOVER, and fitted with superheaters, and in some cases with new cylinders, piston valves, altered valve gear, etc. Cylinders are 18½ in. by 26 in., and coupled wheels, 6 ft. 7 in. diameter.

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Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*F. E. Mackay.*

Down Leeds and Bradford Express, Midland 4-4-0 locomotive No. 558.

Out-of-Course Stops by Standard Express Trains.

By G. A. SEKON.

(*Continued from page* 309.)

THE stop of the 12.8 p.m. Midland express from York to Sheffield and the South, at Burton Salmon at 12.33 p.m., gives a connection from Hull off the 11.5 a.m. train by changing at Selby. Trains in this service usually call at Church Fenton and/or Pontefract, but the 12.8 p.m. misses both these stations. Manton, the junction station on the Midland Nottingham-Kettering line, is given a call by the 8.24 a.m. Nottingham to St. Pancras, at 9.7 a.m. This train runs thence non-stop to London, 90 miles in 98 min. The connecting train from the Peterborough line is due at Manton at 8.45 a.m.

The series of what may be designated " out-of-course " stops made by expresses on the Midland section of the London Midland and Scottish Railway between Leeds and Carlisle are difficult to classify. They occur mostly at stations which are *ipso facto* junctions, but are not prominently treated as such. The 9 a.m. express from St. Pancras runs non-stop from Skipton to Appleby, 56 miles in 75 min. The London and North Eastern Railway connection at Appleby to Penrith, Keswick, etc., means a wait of 91 min., but only 21 min. for the train to Darlington. The two Appleby stations are ¼-mile apart. Two trains in the up direction run non-stop from Carlisle to Appleby (30¾ miles), being preceded by a train stopping at all stations. South of Appleby one is semi-fast, the other runs non-stop to Hellifield, 46 miles in 60 min. The 12.10 a.m. from Carlisle makes Keighley (95¾ miles in 2 hours 2 min.) its first stop. Keighley is the junction for Oxenhope, but there is no passenger train on the branch in the small hours of the morning. The Saturdays only Leeds-Morecambe express has a 20¾ miles spurt from Skipton to Clapham Junction in 32 min., with a branch connection. Daily, a Carnforth

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train runs from Skipton to Wennington, 28¼ miles in 43 min.; from Wennington a connecting train runs to Morecambe.

For many years Trent was an important exchange junction on the Midland Railway, but the opening of the direct line to Nottingham *via* Manton, and other reasons, have shorn Trent of its importance as a junction. The 6.15 p.m. from St. Pancras, however, makes its first stop there, apparently to pick up passengers for Sheffield and the North from Nottingham by the 7.52 train. There is no connection from Derby with this train, whilst London to Derby travellers have a direct express from St. Pancras at 6.25 p.m. The 119¾ miles from St. Pancras to Trent are covered in 131 min. The 10.45 p.m. *ex* Glasgow, also provides a non-stop run from Trent at 5.40 a.m. to St. Pancras (arrive 7.50). This stop affords a connection to Nottingham off the Glasgow train and, with a somewhat long wait at Trent, to Derby.

The 11.20 a.m. from Paddington makes its first stop at Twyford (31 miles in 42 min.) for the Henley branch, continuing to Didcot as a slow train. For the convenience of the Abingdon branch, there is a non-stop service to Paddington from Radley, the junction for the branch. A Worcester express calls at the junction at 8.43 a.m. and covers the 58½ miles to Paddington in 67 min.

The 8.40 a.m. *ex* Portsmouth, London, Brighton and South Coast section, Southern Railway, after making the usual stops, picks up the Littlehampton traffic at Arundel, and leaving there at 9.32, is due at London Bridge at 10.55—58¼ miles in 83 min. The 3.15 p.m. train from Bognor calls at Arundel for Littlehampton branch, leaves at 3.35 and runs thence to East Croydon, being due at 4.38—48 miles in 63 min. This train runs over the single line from Horsham to Three Bridges, to give East Croydon a through service from Bognor, etc.; its destination is Victoria. This route from Horsham has less severe gradients than the Dorking line.

The South Eastern and Chatham section of the Southern Railway has a non-stop run from Charing Cross to Sandling Junction for the Sandgate branch. The train leaves Charing Cross at 11.15 a.m., during the winter runs on Saturdays only; it occupies 84 min. to cover the 65¼ miles. The non-stop up run with the branch connection, leaves Sandling Junction at 8.19 a.m.* and runs to London Bridge in 77 min., the distance being 63½ miles.

Amongst competitive stops those by important London Midland and Scottish Railway expresses at Chesterfield can be included in view of the London and North Eastern Railway's position at "the town with the crooked spire." In this connection the stop of the 5.7 p.m. *ex* Chesterfield at Normanton (38⅜ miles in 47 min.) to give a service to Wakefield (Kirkgate) is interesting. So, too, in these circumstances, is the fact that the through London Midland and Scottish Railway express from Bristol to Nottingham and Lincoln misses Cheltenham, running non-stop from Gloucester (dep. 3.36 p.m.) to Birmingham (51¾ miles in 75 min.), but occupies longer time *en route* than trains that call at Cheltenham. The return train also passes Cheltenham.

The late London and North Western Railway 10.45 a.m. Euston-Central Wales express makes a call a Bletchley (11.41–11.47) to provide connections with the Cambridge branch (up and down) and to Oxford, and then runs non-stop to Stafford—86¾ miles in 98 min. The connecting branch train from Bletchley to Oxford, stops only at Bicester (19 miles in 23 min.), the 12 miles thence to Oxford occupying 20 min. This branch express, although now competitive with the Great Western Railway Bicester service, may be looked upon as a link with the through trains run between Euston and Worcester *via* Bletchley and the Oxford, Worcester and Wolverhampton Railway and Yarnton, some 60 years ago.

The 5.55 p.m. from Paddington, which runs non-stop to Newbury (53 miles in 63 min.) conveys a through carriage for Winchester and Southampton, but the Southampton train stops at all stations on the Southern section of the Didcot, Newbury and Southampton Railway. This spurt to Newbury, with a through coach for Southampton, represents all that remains of what was to be a competitive express service with the London and South Western Railway for traffic between London, Winchester and Southampton. Below Newbury the 5.55

* Public time-table 8.18 a.m.

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stops at all stations to Savernake, and runs to Trowbridge *via* Devizes. The return "competitive" train leaves Southampton at 7.35 a.m., but there is a wait of 27 min. at Newbury ere a service—fast from Frome—departs on the non-stop run to Paddington in 63 min.

The late Great Central Railway has some runs that can be included in the competitive list. These are to be found in the Liverpool-Hull trains (competing with the late Lancashire and Yorkshire section trains) and the Liverpool-Harwich train competing with the service by the North Western section of the London Midland and Scottish Railway. The Hull express leaving Liverpool (Central) at 1.50 p.m., makes its first call at Stockport (Tiviot Dale) at 2.36 (37¾ miles in 46 min.) and runs thence non-stop to Peninstone (25½ miles in 42 min.). The train from Hull, however, runs non-stop from Sheffield to Stockport, 38½ miles in 56 min. This service from Sheffield is also in competition with the Midland trains of the London Midland and Scottish Railway to Stockport and Liverpool.

The Great Central Harwich train, which starts from Liverpool, and, therefore, from Manchester (Central), instead of London Road, leaves the Central station at 3.18 p.m. and runs non-stop to Sheffield, 67 min. being spent in negotiating the 47½ miles, over an awkward and heavily-graded route. Other expresses between Manchester and Sheffield call at Penistone. The train from Harwich, has a non-stop run from Sheffield to Guide Bridge, 36¼ miles in 55 min. Although Aylesbury has two other railways connecting it with London, it is questionable whether the late Great Central Railway non-stop runs between Marylebone and Aylesbury can be designated "competitive," but the 4.55 and 10 p.m. (10.5 Saturdays) give "out-of-course" stops at the Buckinghamshire town in 47, 54 and 55 min. for the 38 miles.

Photo.] [*F. W. Curtis.*

VICTORIA-DOVER *VIA* ORPINGTON DOWN CONTINENTAL PULLMAN-CAR EXPRESS.

South Eastern & Chatham Railway rebuilt 4-4-0 locomotive No. 67.

In many cases it is difficult to apply hard and fast rules of separation with regard to stops under the three last headings under classification. Indeed, stops often result from a combination of reasons. We, therefore, include in one category stops with these characteristics, in some cases pointing out more definitely to which class they belong.

The late Midland Railway gives Luton some calls by its long-distance expresses, *e.g.*, the 8.25 a.m., 11 a.m., 11.45 a.m. and

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1.25 p.m. from St. Pancras, which all make the straw-hat town their first stop; 35 to 41 min. being the time allowed for the run of 30¼ miles. These stops are mainly for picking up, and some of the up long-distance expresses call at Luton for setting down.

The North Western section of the London Midland and Scottish Railway has a long list of unusual stops by important trains. The "Sunny South Special" runs from Northampton to Crewe non-stop (94 miles in 116 min.). The southbound train breaks this run by stopping at Nuneaton. The 6.30 p.m. from Euston to Manchester runs non-stop to Wilmslow (177 miles in 196 min.). Here the train is divided, one portion running to Manchester (London Road) and the other to the Lancashire and Yorkshire section.

Watford has calls by two up expresses that break the usual non-stop runs. The 6.2 and 7.46 p.m. trains from the boot metropolis call there at 6.57 (48¼ miles in 55 min.) and 8.43 respectively. Although Watford is a junction for two branches, the stops cannot be included in that series. The stops are probably made for residents returning from down the line. The section between Crewe and Carlisle produces several "out-of-course" stops of expresses in the early morning hours. The 11 p.m. from Euston call at Wigan (2.48–2.54 a.m.) and runs thence non-stop to Penrith, 87¼ miles in 115 min. The 11.40 p.m. from Euston leaves Warrington at 3.43 a.m., and makes a stop at Oxenholme at 5.20 (67 miles in 97 min.), whilst the 1.20 a.m. *ex* Crewe, after stopping at Preston, calls at Carnforth and then runs non-stop to Carlisle—62¾ miles in 91 min. on Mondays, and 88 min. on other days.

The Great Western Railway with its many main lines, produces several calls included in this section. The noon Paddington to Kingswear through train gives a non-stop run from Exeter to Torquay (26 miles in 35 min.). The up train now makes the inevitable stop at Newton Abbot, running thence to Paddington (193¾ miles in 3 hours 25 min.).

Plymouthians residing in the Mutley suburb, who desire to come to London or the important towns *en route*, are catered for by the morning up expresses from Mill Bay at 7.10, 8.30, 8.40 and 10.25, which instead of stopping at North Road, make a call at Mutley—¼ mile further east. The 7 and 10.10 a.m. Sunday trains from Mill Bay do likewise, but the plan is not followed by down trains on either Sundays or week-days.

The 4 p.m. from Snow Hill, Birmingham, makes its first stop at Hutton. This cannot be included in the branch list so far as Stratford-on-Avon is concerned, as a direct express for Shakespeare's shrine, leaves Snow Hill at 4.10. The 4 p.m., however, gives a good service from Birmingham to the intermediate branch line stations. The 17 miles from Birmingham to Hatton are covered in 22 min.

In the "mail-stop" references we mentioned trains on the Pontypool Road-Shrewsbury section. The 1.32 p.m. from the former station runs through to Shrewsbury, omitting the usual Hereford stop. The 84¼ miles are covered in 108 min. The return train leaves Shrewsbury at 2.25 a.m. and arrives at Pontypool Road at 4.15. A portion runs from Shrewsbury, calling at Hereford, leaving the latter town at 4.3 a.m. for Bristol direct.

The North Eastern section of the London and North Eastern Railway has remarkably few trains that can be included in this article. A fast on the Newcastle-Carlisle line runs from Haltwhistle (11.45 a.m.), giving a connection to the Alston branch to Scotby (12.19 p.m.). A North British section train gives an unusual run on this division of the former North Eastern Railway. Instead of calling at all stations, it runs non-stop Newcastle (dep. 4.27 p.m.) to Stocksfield, and then omits to call at the next station, but makes the remaining stops as usual, 21 min. are allowed for this 13-mile run.

The only other example of a formerly North Eastern Railway train calling for inclusion in this article is a stop at Castle Howard. The York-Scarboro' fast trains run non-stop to Malton, except the 10 a.m., which calls at Castle Howard at 10.23, the distance being 15¾ miles. The nomenclature of the station may explain this "out-of-course" stop—but this is merely vaticination.

Examples are scarce on the Lancashire and Yorkshire section of the London Midland and Scottish Railway. Liverpool-Preston fast trains usually call at both the adjacent junctions of Ormskirk and Burscough, but the 7.55 a.m. and 1.13 p.m.

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(Saturdays) call only at Ormskirk—12¼ miles from Exchange (time, 20 and 21 min.), whilst the 12.40 p.m. patronises Burscough Junction only–14¼ miles in 21 min. From Preston, the 9.7 a.m. makes only the Ormskirk stop—16½ miles in 24 min.

The standardised form of the time-table of the London and South Western section of the Southern Railway reduces the opportunities for "out-of-course" stops. The 8.30 a.m. Weymouth train from Waterloo calls at Surbiton and Woking, and then runs non-stop to Winchester, omitting the important junction but the 7 p.m. occupies 5 min. more. There is an up non-stop run from Winchester at 12.58 p.m. in 78 min. Andover Junction is given a non-stop run to Waterloo on Sundays by the 7.47 p.m., which is allowed 75 min. for 66½ miles. This train, which leaves Plymouth (Friary) at 3 p.m., gives a connection with the 8.10 Midland and South Western Junction Railway train from Andover Junction to Swindon Town.

The Sunday calls of late Great Central expresses at High Wycombe, running thence a non-stop to Leicester, can be classified with that of the Great Western Railway

Photo.] [*F. E. Mackay.*

WATERLOO-WEST OF ENGLAND RESTAURANT CAR EXPRESS.

London & South Western Railway 4-6-0 locomotive No. 739.

of Basingstoke. In the up direction the 7.39 a.m. from Bournemouth Central is non-stop from Winchester to Waterloo, 66¾ miles in 78 min. The 3.19 p.m. from Bournemouth (Central) has a 36-miles spurt from Basingstoke to Surbiton in 39 min. The Surbiton stop is doubtless convenient to residents of this favourite London and South Western dormitory, who have been down the line on business. On Sundays, Winchester is specially favoured as the first stop by the Bournemouth expresses leaving Waterloo at 11 a.m. and 2 and 7 p.m. By the first two trains the 66¾ miles are covered in 83 min., at Princes Risborough (*see* RAILWAY MAGAZINE for March, page 306). The 11.15 a.m. from Marylebone, leaves High Wycombe at 11.57 and running for 88 min., makes its next stop at Leicester, a distance of 79½ miles. The up run is by the 3.28 p.m. from Leicester, which occupies 94 min. on the non-stop journey to High Wycombe.

The expresses of the Great Northern section of the London and North Eastern Railway do not make many out-of-course stops. The train which runs on Mondays and Fridays only, due at King's Cross at 10.40 a.m. after leaving Peterborough,

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calls at Huntingdon and covers the 58¾ miles thence to London in 66 min. The 5.5 a.m. from Grantham to Nottingham makes its first stop at Radcliffe-on-Trent, the 17¾ mile run occupying 26 min. The 2.55 p.m. from Grantham is shown as making the same run, but it has a conditional intermediate stop to set down. With the exception of two, which are non-stop to Nottingham, other trains on this branch call at all stations.

The London, Brighton and South Coast section of the Southern Railway has a few stops that come under one or another of the three headings now under discussion. For development of residential districts can be included the 1.20 (Saturdays) and 6.0 p.m. trains from London Bridge, calling at Horley—40 min. are allowed for the 25½ miles. The 6 p.m. on Mondays to Fridays makes only the Horley stop between London Bridge and Brighton. An up run under this category is the 9.23 a.m. from Lingfield, non-stop to London Bridge —26¼ miles in 44 min. A more important out-of-course up non-stop run on the late London, Brighton, and South Coast Railway is from Chichester at 6.59 p.m. to Victoria, occupying 94 min. for the 69¾ miles.

Bromley South on the South Eastern and Chatham section of the Southern Railway is an important residential suburb and is given special consideration. Some "out-of-course" calls at Bromley South are at: 11.2 a.m., thence non-stop to Faversham; 10.16 p.m., next stop Wrotham; and by an up train at 3.16 p.m., previous stop Maidstone East. On Sundays, Bromley South has a non-stop run thence to Faversham, and two to, and two from, Maidstone East. The service from the South Eastern section to the Maidstone East line, which is over the Chislehurst loop, is meagre, but one up and one down train run non-stop between Hither Green and Maidstone East (34 miles in 45 min.). There is also a non-stop run from Otford Junction to Hither Green. Wadhurst, with about 4,000 inhabitants, is given a non-stop up train; the 8.55 a.m. from Hastings, leaving Wadhurst at 9.36 and running thence to London Bridge—37½ miles in 53 min.

The instances we have given of "out-of-course" stops, whilst by no means exhausting the list, will, we hope, cause readers of the RAILWAY MAGAZINE to become interested in this phase of railway working.

Photo.] GREAT WESTERN RAILWAY. [*Henry L. Salmon.*

Birkenhead–Paddington express.
Two-cylinder 4-6-0 locomotive No. 2930, "Cefntilla Court."

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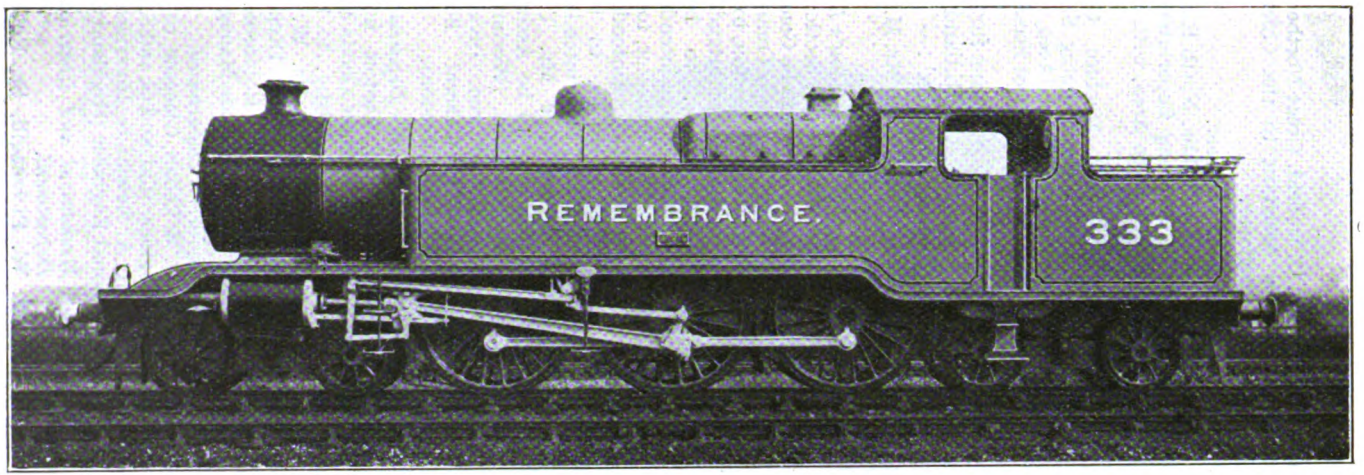
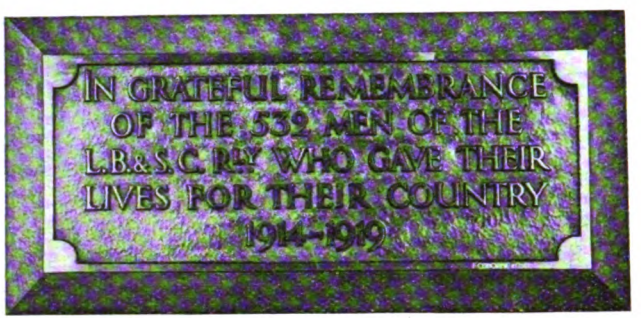
"DEDICATION" LOCOMOTIVE SOUTHERN RAILWAY (L.B. & S.C. SECTION).



By the courtesy of Colonel L. B. Billinton, C.B.E., Locomotive Engineer, Southern Railway (L.B. & S.C. Section), we are enabled to reproduce herewith a photograph of one of the latest 4-6-4 type express passenger tank locomotives designed by him and built at the Brighton works. This engine, No. **333**, has been dedicated by the company to the memory of their men who fell in the war. It has been named "Remembrance," and a bronze memorial tablet as illustrated has been affixed to the tank side.



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Railway Official Changes.

IN the February and March numbers particulars were given of principal appointments under the organisations now being set up by the newly-constituted railway companies. Certain further appointments have been noted in "What the Railways are Doing," but official announcements since issued may appropriately be covered, accompanied by a selection of portraits.

Two announcements issued by the London and North Eastern Railway may first be given. The first was as follows :—

Mr. H. N. Gresley, Great Northern Section, to be Chief Mechanical Engineer of the company with charge of the Locomotive and Carriage and Wagon Shops. (It is proposed to transfer the working of locomotives from the Chief Mechanical Engineer's Department to a separate Running Department.)

Mr. W. T. Weeks, Great Northern Section, to be Chief Stores Superintendent.

Mr. C. H. Jeune, Great Eastern Section, to be Assistant Stores Superintendent, Liverpool Street Station, E.C.

Mr. P. J. Dowsett, Great Northern Section, to be Assistant Secretary.

Mr. T. Storey, North Eastern Section, to be District Superintendent, Leeds (North Eastern Area).

Mr. W. E. Blakey, North Eastern Section, to be Assistant District Superintendent, Newcastle (North Eastern Area).

This was followed by a further announcement, as follows.:—

Chief Mechanical Engineer's Department.

Mr. A. C. Stamer, North Eastern Section, to be Chief Assistant Mechanical Engineer, with office at Darlington.

Mr. F. Wintour, Great Northern Section, to be Assistant Mechanical Engineer, Southern Area, with office at Doncaster.

Mr. R. Thom, Great Central Section, to be District Mechanical Engineer, Gorton.

Mr C. W. L. Glaze, Great Eastern Section to be District Mechanical Engineer, Stratford.

Mr. W. Chalmers, North British Section, to be Mechanical Engineer, Southern Scottish Area.

Mr. T. E. Heywood, Great North of Scotland Section, to be Mechanical Engineer and Running Superintendent, North Scottish Area.

Mr. O. Bulleid, Great Northern Section, to be Assistant to the Chief Mechanical Engineer.

Running Department.

Mr. J. H. Smeddle, North Eastern Section, to be Running Superintendent for the North Eastern Area, with Headquarters At York.

Mr. W. G. P. Maclure, Great Central Section, to be Running Superintendent for the Southern Area, with Headquarters at Liverpool Street, London.

At about the same time further appointments on the London Midland and Scottish Railway were announced :—

Secretary's Department : Mr. M. M. Parkes to be Assistant Secretary.

Chief General Superintendent's Department.

Passenger Commercial Section : Mr. C. R. Byrom, Derby, to be General Superintendent (Passenger Commercial) : Mr. J. A. Milligan, Euston, to be Passenger Commercial Superintendent ; Mr. W. Village, Derby, to be Passenger Commercial Superintendent ; Mr. G. Hawkins, Manchester, to be Passenger Commercial Superintendent ; Mr. W. Crozier, Glasgow, to be Passenger Commercial Superintendent.

Operating Section : Mr. T. W. Royle, Manchester, to be Assistant General Superintendent (Western Division) ; Mr. T. McEwen, Inverness, to be Assistant General Superintendent (Northern Division).

Chief Goods Manager's Department.

Mr. W. A. Ree, Euston, to be Outdoor Assistant to Chief Goods Manager ; Mr. F. D. Antill, Derby, to be Divisional Goods Manager ; Mr. W. A. Marsden, Manchester, to be Divisional Goods Manager ; Mr. J. Robinson, Glasgow, to be Divisional Goods Manager.

Chief Engineer's Department.

Mr. D. McLellan, Glasgow, to be Divisional Engineer (Cal. and G. and S.W. Sections); Mr. A. Newlands, Inverness, to be Divisional Engineer (Highland Section).

Chief Mechanical and Electrical Engineer's Department.

Mr. W. Pickersgill, St. Rollox, Glasgow, to be Mechanical Engineer (Northern Division) ; Mr. D. C. Urie, to be Assistant Mechanical Engineer (Northern Division).

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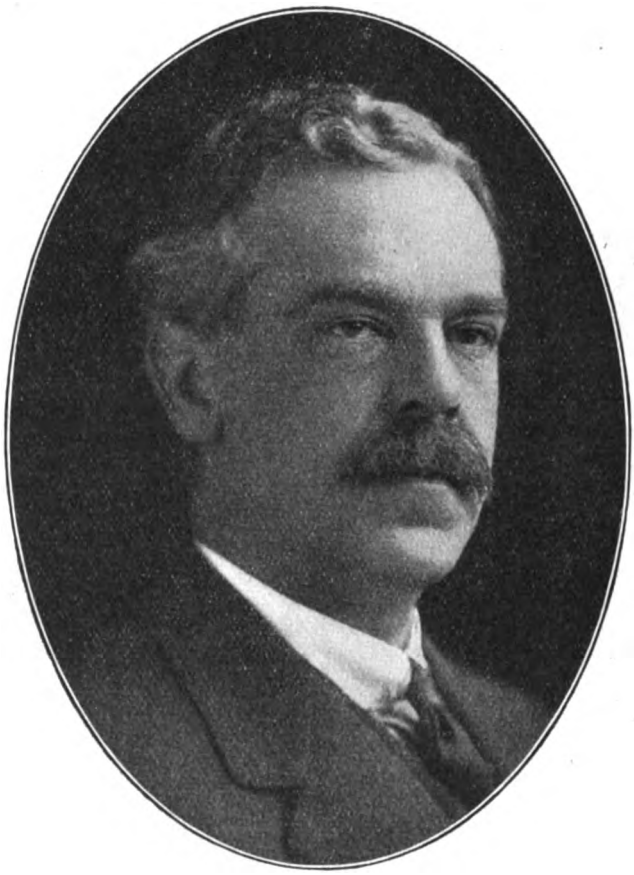

Photo.] [*Elliott & Fry.*

Mr. H. N. GRESLEY, C.B.E., M.Inst.C.E., M.I.Mech.E.,

Chief Mechanical Engineer,
London and North Eastern Railway.

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Photo.] [*Elliott & Fry.*

MR. A. C. STAMER, C.B.E.,

Chief Assistant Mechanical Engineer,
London and North Eastern Railway.

MR. F. WINTOUR, O.B.E.,

Assistant Mechanical Engineer,
Southern Area,
London and North Eastern Railway.

MR. R. A. THOM, O.B.E.,

District Mechanical Engineer,
Gorton,
London and North Eastern Railway.

MR. C. W. L. GLAZE, O.B.E.,

District Mechanical Engineer,
Stratford,
London and North Eastern Railway.

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Photo. [*Elliott & Fry.*

MR. W. G. P. MACLURE,

Running Superintendent,
Southern Area,
London and North Eastern Railway.

MR. T. E. HEYWOOD,

Mechanical Engineer and Running Superintendent, Northern Scottish Area, London and North Eastern Railway.

MR. J. H. SMEDDLE, O.B.E., T.D.,

Running Superintendent,
North Eastern Area,
London and North Eastern Railway.

MR. A. NEWLANDS, C.B.E.,

Divisional Engineer
Highland Section,
London Midland and Scottish Railway.

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[Photo.] [W. W. Winter.

MR. J. PURVES,
Chief Outdoor Assistant to Carriage and Wagon Superintendent, London Midland and Scottish Railway.

MR. E. J. H. LEMON,
Divisional Carriage and Wagon Superintendent, Derby, London Midland and Scottish Railway.

MR. I. KEMPT,
Divisional Carriage and Wagon Superintendent, Glasgow, London Midland and Scottish Railway.

MR. W. SINCLAIR,
Carriage and Wagon Works Manager, Stoke, London Midland and Scottish Railway.

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Carriage and Wagon Superintendent's Department.

Mr. J. Purves, Derby, to be Chief Outdoor Assistant to Carriage and Wagon Superintendent; Mr. E. J. H. Lemon, Derby, to be Divisional Carriage and Wagon Superintendent; Mr. I. Kempt, Glasgow, to be Divisional Carriage and Wagon Superintendent; Mr. W. Sinclair, Stoke, to be Carriage and Wagon Works Manager (Stoke); Mr. C. O. D. Anderson, Barrow, to be Carriage and Wagon Works Manager (Barrow); Mr. D. Smith, Barassie, Ayrshire, to be Carriage and Wagon Works Manager (Barassie).

Joint Accountants' Department.

Mr. J. A. Garratt, Derby, to be Divisional Accountant (Derby).

Rating Agent's Department.

Mr. J. McKinlay, Glasgow, to be Divisional Rating Agent (Northern Division).

It should be noted in connection with the Chief General Superintendent's Department that the North Staffordshire Section is now, for operating purposes, included in the Midland Division.

Railway Returns for 1922.

A PRELIMINARY Statement has been issued giving provisional statistics for the railways of Great Britain for the year 1922, from which certain items may be extracted as follows:—

REVENUE RECEIPTS AND EXPENDITURE—	£
Gross receipts	237,800,000
Expenditure	190,600,000
Proportion of amount receivable under Section 11, Railways Act, 1921	1,100,000
Miscellaneous receipts (net)	6,100,000
Total net income	£54,400,000

ROUTE MILEAGE—	
Running lines, first track	20,155
,, ,, second ,,	12,715
,, ,, third ,,	1,698
,, ,, fourth ,,	1,316
,, ,, over four tracks (reduced to single track)	751
Sidings (reduced to single track)	14,783
Total single track, including sidings	51,418

TRAIN MILEAGE—	
Coaching	238,369,000
Freight	131,727,000
Shunting, &c.	169,563,000
Total engine-miles	539,659,000

FREIGHT TONNAGE—	
General merchandise	52,865,000
Coal, coke and patent fuel	200,009,000
Other minerals	48,544,000
Total	301,418,000
HEAD OF LIVE STOCK	16,706,000

LOCOS. AND ROLLING-STOCK—	
Locomotives, steam	24,204
,, electric	81
Passenger carriages	51,402
Other coaching vehicles	20,586
Freight vehicles	729,783
Service vehicles	50,477
Road vehicles, motor	2,098
,, ,, horsed	32,997

NUMBERS OF PASSENGERS (single journey basis, exclusive of season tickets)—	
First class	20,583,000
Second ,,	4,446,000
Third ,,	861,814,000
Workmen	299,627,000
Total	1,186,470,000

SEASON TICKETS—	
First class	138,200
Second ,,	90,000
Third ,,	695,800
Total	924,000

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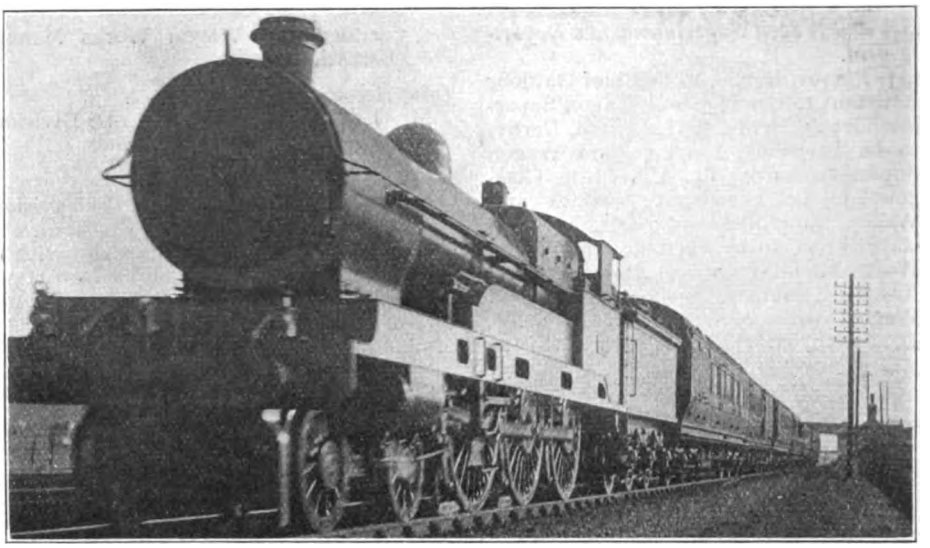

Photo.] [*Chas. S. Lake.*

EUSTON-LIVERPOOL EXPRESS NEAR STOKE HAMMOND (BLETCHLEY.)
"Claughton" Class Locomotive.

The Night Mails of Crewe.

By K. C. MARRIAN, A.M.Inst.C.E.

THAT pivot of the old London and North Western system—Crewe—where lines radiate in every direction, is, from its geographical position, probably the most important junction in the country, not only from the point of view of passenger traffic, but also mail traffic, for where else can one see so many travelling post office vans and sorting carriages during the night.

The busiest period of the 24 hours is from 11.30 p.m. to 2 a.m., but the night's work can be said to commence at 11 p.m. with the simultaneous arrival of the Inverness, Dundee and Aberdeen down sleeping car train, and a semi-fast from Hereford, followed at 11.13 by the boat train for Stranraer, which has hardly got clear, when at 11.18 the West of England Mail steams into No. 2 Platform. This has a miscellaneous collection of through coaches—Exeter to Glasgow, Cardiff to Liverpool, Penzance to Liverpool, Plymouth to Liverpool, Plymouth to Manchester, and a mail van which terminates here—the "Cardiff-Crewe Railway S.C."

Trains now follow in rapid succession, 11.28 p.m. sees an arrival from Swansea on No. 1 with through coaches from Swansea to York, and Shrewsbury to Newcastle, and two London and North Western mail vans for York—the "Shrewsbury-York Railway S.C." then a local from Manchester runs into No. 6 at 11.29, and at 11.30 the Bangor Mail—"Bangor and Crewe T.P.O. from West"—arrives on No. 3; the Birmingham Mail—"Birmingham and Crewe S.C."—follows at 11.33, and a North Stafford train from Stoke at 11.35.

The next arrival is the "North Western T.P.O. Night Down," the famous Down Postal Special established in 1885; this train has now the fastest timing of any between London and Aberdeen, leaving Euston at 8.30 p.m. and arriving at the granite city at 7.52 next morning. Before the war parcel sorting was carried out on the journey, and the arrival at Aberdeen was 17 minutes earlier, despite the consequent heavier loading. It is interesting here to note that the departure time of the night Scotch Mail from Euston has been 8.30 p.m. since its inception in 1838. No. 2 welcomes this train at 11.44, and during its 15 minutes' stay much

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exchange of mails is done, and with the arrival at 11.58 on No. 1 of the Down Irish Mail—" London and Holyhead T.P.O. Night Down "—Platforms 1 and 2 become a veritable sea of mail bags.

The Irish Mail leaves at 12.8 a.m. and at the same time the Liverpool coaches, which arrived from the West at 11.18, leave the north end of No. 2; meanwhile at 12.3 the old Scotch Up Limited has arrived on No. 6 with a through coach from Aberdeen for Plymouth, and one from Glasgow for Exeter; this train in pre-war days conveyed a T.P.O., but since the withdrawal of parcel sorting on the postal specials, there has been ample accommodation for all letter sorting on the " Up Special T.P.O.," which reaches No. 4 Platform at 12.19, and has a stop of 12 min. This train has not so good timing as its down counterpart, leaving Aberdeen as it does at 3.25 p.m. and reaching Euston at 3.55 a.m.

Crossing over we find the Shrewsbury–York mail marshalled at the south end of No. 1, ready to leave at 12.30, the West of England coaches for Manchester on No. 2 ready for 12.40, and the stock of the Bangor Mail which arrived at 11.30 waiting to leave No. 3 at 12.45 for Birmingham—the return journey of the " Birmingham and Crewe S.C." 12.50 sees the departure for Glasgow of the sleeping car train from Euston which followed the York Mail on No. 1, and at the same time the old Up Limited continues its journey to Euston; a minute later through coaches for Penzance and Plymouth arrive from Manchester and at 12.53 the Liverpool to London sleeping car train runs into No. 4, with through coaches for Cardiff, Penzance and Plymouth; leaving these behind, it journeys on its way at 1.5 a.m.

The next arrival is the supplementary mail for Carlisle—9.30 from Euston—known as the " 10 p.m. N.W. Night Mail," because it formerly left Euston at 10 p.m.; running into No. 1 at 1.3, the parcel vans and mail van, together with the Exeter–Glasgow coach which arrived at 11.18, leave at 1.20; the remainder of the train shunting on to No. 2, and departing at 1.40 for Oxenholme and the Furness district.

While these operations have been taking place on Nos. 1 and 2, Nos. 3 and 4 have again become a scene of activity, for at 1.15 the York West Mail arrives at No. 3 with two London and North Western T.P.Os.—"York-Shrewsbury Railway S.C." a N.E. coach from Newcastle for Shrewsbury, and L.N.W. coaches from York for Swansea, and the various through coaches from Aberdeen, Glasgow, Manchester and Liverpool for the West of England have been marshalled together and a Great Western Post Office van added—" Crewe-Cardiff Railway S.C." The latter leaves at 1.25, and the former at 1.45, and the North Stafford train returns to Stoke from No. 5 Bay at 1.30.

Back again to No. 2, we see the Bangor Mail—" Bangor and Crewe T.P.O. from East "—draw out at 1.50, and there is a breathing space of five minutes before the Edinburgh, Dundee and Aberdeen Down " Sleeper " pulls in, stays 10 minutes, and is away again.

Traffic now beings to slacken, the bookstall which has been fully lighted up and doing a brisk trade, begins to close down, and the refreshment rooms, which up till now have been " playing to packed houses," show signs of a trade depression.

There is now a 2.15 for Liverpool from No. 2, and a 2.40 for Manchester from No. 7 Bay, carrying parcels principally, while No. 5 is again all excitement with the arrival at 2.35 of the Up Irish Mail—" London and Holyhead T.P.O. Night Up "—which causes another stampede to the refreshment rooms; this leaves again at 2.45, followed by a Birmingham connection at 2.55.

At 2.58 No. 2 welcomes the 11.40 p.m. from Euston, with its load of sleepers; the front portion goes forward to Glasgow at 3.10, and the rear portion to Manchester at 3.45, before which the Glasgow, Inverness and Perth Up " Sleeper " has arrived on the other side at 3.30, to leave again at 3.41, followed by two more Up Scotch trains, the Glasgow and Edinburgh at 4.5, and the Aberdeen, Dundee and Stranraer at 4.30, which depart at 4.20 and 4.40 respectively.

During the past hour the postal officials of the last two sorting carriages have been busy in the Bay platforms—the " Crewe to Liverpool S.C.," which is attached to the Liverpool Down Sleeping Car train arriving on No. 1 at 4.43 to leave at 5.0 and the " Manchester and Crewe S.C.";

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which leaves at the same time, as also does a train for Chester.

With the departure of the 5.5 for Birmingham, and the 5.30 for Barrow, the night can be said to be over, and Crewe can then commence its ordinary day's work, and prepare for another busy night.

Before leaving the subject of Crewe mails, it may be mentioned that the postal authorities have not reinstated any of the Day Mail Travelling Post Offices serving Crewe, which were withdrawn during the war; these may be summarised as follows:—

London and Crewe S.C. Down Day Mail: Crewe arrive 9 a.m. (5.15 a.m. from Euston).

North West T.P.O. Day Down (for Carlisle): Crewe arrive 11.6 a.m. (7.10 a.m. from Euston).

L. & N.W. T.P.O. Mid-day Mail Down: Crewe arrive 5.4 p.m. (1.30 p.m. from Euston).

L. & N.W. T.P.O. Mid-day Mail Up: 10.49 a.m. from Crewe (Euston arrive 2.55 p.m.).

Liverpool and London T.P.O.: 1.5 p.m. from Crewe (12 noon from Liverpool).

London and Crewe S.C. Up Day Mail: 3.2 p.m. from Crewe (6.10 p.m. arrive Euston).

The only ones now running are the up and down Holyhead Day Mails.

AN HISTORIC FRENCH LOCOMOTIVE.

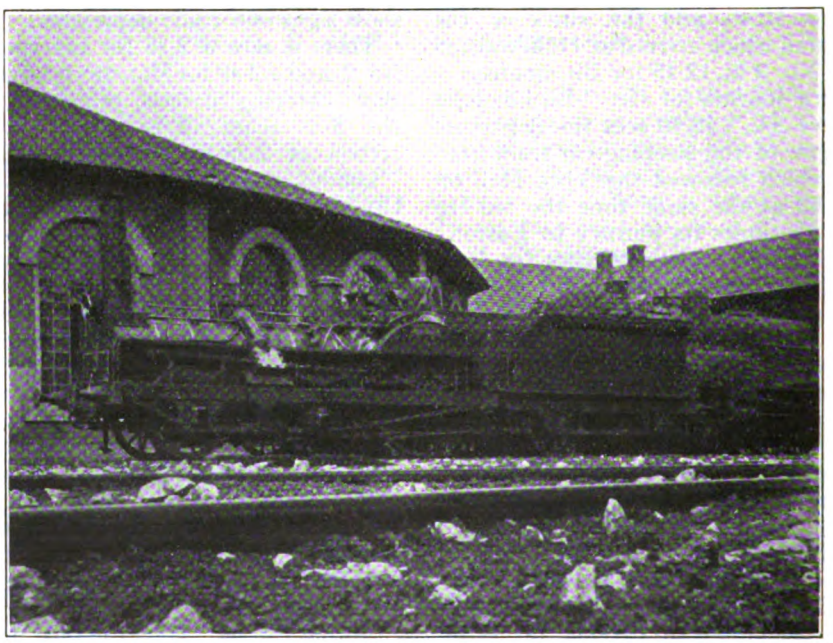

Photo.] [*Lord Monkswell.*

OLD CRAMPTON LOCOMOTIVE, C. DE FER DE L'EST.

(See also "Pertinent Paragraphs.")

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition* (1923) *of this standard railway reference work is on sale at* 5*s. net, or by post from the* RAILWAY MAGAZINE *Offices,* 33, *Tothill Street, Westminster, London, S.W.*1, *to any part of the world,* 5*s.* 9*d.*

Trans-American Railways.

On the prairie sections and other parts of trans-American main lines, and generally in sparsely-populated districts, the stations are frequently many miles apart. In fact, in many instances, there is little more than an office for the accommodation of an agent and/or a train telegrapher, one of whose duties it is to advise the train despatcher in charge of the division of the movements of trains, and to receive instructions to be given to enginemen of calling trains, or which may be stopped specially by the exhibition of a train-order signal. There may be only a very few trains daily and passengers may be very occasional. In many cases, in fact, they are "flag" stations, which are ignored by trains unless required to call or it is desired to side-track one train to allow another in the same or opposite direction to pass. Under these circumstances there are really no signal-boxes at all, the telegraphic office constituting the nearest approach thereto, and for many miles (which will probably be single track, with sidings only here and there) trains run under the instructions of the division train despatcher, who works on information of train movements transmitted to him, and advices from the local telegraphers as to where trains may be and whether they have been side-tracked, if that is required. Methods of this kind are more or less usual in many parts of the world where trains are very infrequent and local traffic very small. On the busier lines in America, as here, more elaborate signalling methods are necessarily installed, and frequently automatic or semi-automatic signals are employed, including systems adaptable to single-line working, though in British Colonies and Dominions train tablet apparatus is often used in special forms suited to the conditions, and, in fact, practically constituting the signalling system.

[Reply to "SILURIAN."]

0-6-0 Engines, Somerset and Dorset Joint Railway.

Mr. E. Gulliford, of Blandford, writes in further reply, as follows: "The engines in question (Nos. 57—61 inclusive) were built in 1922 by Sir W. G. Armstrong, Whitworth & Co., Ltd., at Scotswood Works, Newcastle-on-Tyne (works Nos. 468–472 inclusive). The same firm also constructed 50 locomotives of similar type for the Midland Railway. During the past year the following S. & D. 0-6-0 tender engines have been broken up:—Nos. 35, 36, 37, 38 and 48, the new superheater engines being obtained to replace them. The six 0-6-0 engines formerly Nos. 56 to 61 inclusive, have been renumbered 33 to 38. The Class "2" 5 ft. 3 in. 0–6–0 engines Nos. 63, 64, 65 and 66

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have been rebuilt with large Belpaire boilers with 175 lb. pressure, and are now Class "3." No. 62 of the same class is being similarly dealt with. The S. & D. goods engines are being painted black without any lining as they go through the shops for heavy repairs."

[Further reply to Z. C. ELWES.]

Traffic Improvements at King's Cross, London and North Eastern Railway.

We do not quite appreciate your difficulty. Obviously, a train could not be allowed to leave platform No. 11 for Down Main Line No. 1, or, indeed, either of the other down lines at the same time as a road was signalled for a train from the Up Relief Line to Nos. 11, 12 or 13 platforms. Apparently, your difficulty is that, to suit the interlocking and for other reasons, certain points not actually involved, frequently have to be placed in a particular position, although that position may conflict with the route set up. In a complicated area, therefore, one cannot suggest that any particular route is set up from the position occupied by individual points, though, obviously, everything must be in order before any given route, either in or out, can be set up and signalled, and any apparent contradictions or conflicting positions would not, of course, then be possible.

[Reply to C. E. T. J.]

"Cosmopolitan" Railway Stations.

Grouping will necessarily reduce possibilities in this direction to a very large degree, and, as you suggest, there are now very few instances where more than three railway companies use the same station, as occurs at Aylesbury—Great Western, London Midland and Scottish, London and North Eastern, and Metropolitan. Moorgate Street may also be suggested, where the Metropolitan, London Midland and Scottish, London and North Eastern, Great Western, Metropolitan District, and (if and when running powers are resumed) Southern Railways are concerned. The Great Western and Great Central Railways Joint Committee, together with other similar joint arrangements, remains as before, except that the new railway companies replace those they succeed as parties to the joint arrangement.

[Reply to "KIMBLELITE."]

Train Combinations under Grouping.

There will, no doubt, be many instances of unusual combinations of locomotives and rolling-stock of hitherto independent lines, though the examples you mention are of interest, *i.e.*, a London and North Western saloon attached for a special party travelling from Barrow-in-Furness to York via Carnforth and the Midland route, a "Claughton" 4-6-0 piloting a Midland goods train between Bare Lane and Hest Bank (to avoid light running, as you suggest), a Furness Railway locomotive working through to Liverpool with a special train including London and North Western and Lancashire and Yorkshire vehicles, and a complete Furness train, locomotive and stock, from Barrow to Aintree.

[Reply to H. R. STONES.]

Exceptional Brake Applications.

A Bath correspondent mentions a parallel to the incident referred to in our previous reply, quoting from the *Great Western Railway Magazine* for August, 1915, in which, under the heading "Departmental News," appeared the following: "A short delay from a most exceptional cause occurred to the 10.20 a.m. passenger train from Paddington to Worcester on June 27. When the train was near Pangbourne a rook flew against the front of the engine, striking the pipe of the vacuum brake and causing the pipe to become detached from the plug. This admitted air to the brake pipes and caused the brakes to be applied, thus stopping the train."

[Further reply to E. B. GOWRY and R. C. D. MARRIOTT.]

Locomotive Interchanges.

While we always welcome notes in regard to train working curiosities, those due to grouping are so numerous and will shortly become so common that space cannot be afforded to notice all or many of them. Besides London and North Western 0-6-2 tank engines, Lancashire and Yorkshire 2-4-2 and Midland 0-4-4 tank engines have been used on the Broad Street-Great Northern services. Lancashire and Yorkshire and Midland coaching sets on the late London and North Western Railway system are also now frequently to be

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noticed. Your remarks as to Lancashire and Yorkshire Railway six-coupled tank engines on the North London line, and the renumbering of North London engines are noted.

[Reply to " READER, HARROW."]

The East Coast Route to Scotland.

The 4.45 a.m. from King's Cross, though it gives a service to Edinburgh (Waverley), is not a through train, connection being made with a Glasgow express at York. Engines are usually changed on through trains at Grantham, York and Newcastle, though occasionally Doncaster and Peterborough are engine-changing stations on the Great Northern section. Shaftholme Junction marks the actual point where Great Northern and North Eastern ownerships met, but it has always been the practice to disregard this as a division point, Great Northern engines working through to York, though North Eastern engines and trains worked the local services, and, to some extent, main line traffic into Doncaster from the North.

[Reply to C. E. BEAMES.]

Gradient Profiles.

In earlier volumes of the RAILWAY MAGAZINE, gradient profiles of nearly all the main routes were given, and, more recently, sections have been repeated in Mr. Allen's articles. Many others have also appeared in connection with articles on various sections of line. If you can consult a file of the RAILWAY MAGAZINE in a public library, you will be able to find most of those you require. In the 1911 and 1919 editions of the RAILWAY YEAR BOOK lists of principal articles which had appeared in the RAILWAY MAGAZINE, including the special gradient articles, were given in connection with the respective railways.

[Reply to E. V. DOLBY.]

Through Carriages to Southampton.

On Thursdays a through carriage is run from Glasgow on the 10.30 p.m. train from the Central station, together with one from Aberdeen on the 7.30 p.m. for Southampton, for the purpose of conveying passengers travelling to join steamers at that port. The carriages are not advertised for ordinary passengers; hence the fact that, except on the Caledonian section, no reference appears in the ordinary time-tables. They are attached to West Coast expresses and work from Willesden Junction, via Addison Road to Waterloo, where they are attached to the London and South Western boat train.

[Reply to G. H. CANNON.]

Great Central Locomotives.

The " Director " and improved " Director " 4-4-0 locomotives are the most up-to-date of Great Central locomotives, but there are, of course, numerous 4-4-0's of other and older classes. The London engine sheds are at Neasden. In addition to the " Sir Sam Fay " class there are several series of 4-6-0 two-cylinder locomotives with 6 ft. and 6 ft. 6 in. coupled wheels, and the four-cylinder 4-6-0's with 6 ft. 6 in. and 5 ft. 6 in. coupled wheels. Some of the " Atlantics " are three-cylinder compounds; otherwise, all the 4-4-2's are generally similar.

[Reply to " CENTRALIAN " and " JUBILEE."]

Russian Railways.

Statements that the Russian Railways are not working must, of course, be interpreted with some elasticity. What is meant is that there is nothing approaching to normal operation, and, no doubt, on some sections traffic is entirely discontinued. The conditions are, however, sufficiently abnormal to prevent *Bradshaw* or any other publication giving reliable particulars. The railway gauge throughout Russia proper is 5 ft., but connections at the frontier stations involve the general European gauge of 4 ft. 8½ in.

[Reply to F. W. ROWSWELL.]

Automatic Train Control, Great Western Railway.

This is a system, partially electric, installed on all lines between Paddington and Reading, and on several branch lines. A considerable number of engines are fitted, though we have no particulars as to the exact figures. A shoe on the engine makes electrical contact with the ramp, and if signals are adverse a warning is given on the engine and the brake partially applied, usually at the distant signals. On single-line sections, obviously, means must be

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provided whereby indications are only received for the appropriate direction.

[Reply to " SILURIAN."]

" Running Hot."

This term is used to indicate that a bearing or other part is heating up, usually owing to insufficient lubrication, from one reason or another, or from some other cause, and it is necessary to stop to remedy the difficulty or possibly to remove the engine or vehicle in trouble. Such an occurrence on the engine is soon detected either because of smoke or the burning of oil pads or even of the metal, or by other signs. On a vehicle it should soon be noticed.

[Reply to " G. W. S."]

Duplicate Locomotives.

As explained on many occasions, these are engines which are no longer ranked in the capital stock, having been replaced by new ones, and usually being locomotives which are working out their last days, it not being intended to reconstruct or repair them on a heavy scale. Some railways indicate such locomotives in various ways, but we are not aware that any special system is employed on the South Eastern and Chatham section of the Southern Railway.

[Reply to " HASTINGS."]

Metropolitan District Railway.

Between Hammersmith and Turnhan Green Metropolitan District trains use lines built alongside those of the late London and South Western Railway by virtue of running powers. From Putney Bridge to Wimbledon running powers over the London and South Western lines are exercised, and to Richmond over the North and South Western Junction and London and South Western routes.

[Reply to " V. W. O."]

Railway Sheets, Ropes, &c.

In so far as it is necessary for present purposes, instructions have, no doubt, been given as to the method of dealing with sheets, ropes, horse covers, &c., as between the companies now grouped, though in many cases such matters are being dealt with as before, pending final arrangements. Doubtless, in due course, systematic numbering schemes for the entire systems will be adopted, but, meanwhile, the old numbers, &c., must suffice.

[Reply to A. W. H.]

South African Railway Gauges.

Usual gauge in South Africa is 3 ft. 6 in., though there are also 2-ft. 6-in. and 2-ft. gauge lines. Narrow-gauge railways are usually cheaper to construct than standard gauge. On the South African lines, however, engines and rolling-stock are as large or larger than those here, though the difficulties of construction and the circumstances prohibit very fast running, probably the only real drawback of the 3-ft. 6-in. gauge. [Reply to D. R. DAS.]

Deepest Railway Tunnels.

It is doubtful whether any answer could be given to this question, in that the depth underground is governed by the height of the ground above the tunnel to ascertain which would require careful investigation of the construction drawings of every tunnel passing under a hill or mountain of any magnitude. We have no information as to the deepest ventilating shaft. [Reply to H. H.]

Irish Railways.

The letters U^2, P, O^3, R^2 noted on passenger rolling-stock on the Great Northern Railway of Ireland indicate the class to which the particular vehicles belong. We have never published a special Irish number of the RAILWAY MAGAZINE, but practically all important railways have been dealt with more or less fully, and, in the aggregate, a large number of articles of Irish interest have been published.

[Reply to P. J. LAVERY.]

Newcastle-Swansea Through Trains.

You are correct in pointing out that these trains run via Chipping Norton, Cheltenham and Gloucester. Obviously, therefore, the Great Western locomotives would not work to Swindon, though the point of the comment in the March number was that Great Western locomotives work the trains to and from Leicester, London and North Eastern Railway.

[Reply to C. E. T. J.]

Colours of Locomotives, &c.

Full particulars of the colouring of engines and rolling-stock prior to grouping are included in the 1921 edition of the

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RAILWAY YEAR BOOK. The 1923 volume, which has just been published, contains particulars, as far as available, of the new colour schemes, while reference has already been, or will be, made in the pages of the RAILWAY MAGAZINE.

[Reply to H. N.]

Irish Locomotives in England.

The Dublin & South Eastern 2-4-2 tank engines which were used at Richborough during the war were three of those originally purchased from the London & North Western Railway, and they had, therefore, already been adapted from the 4 ft. 8½ in. to the 5 ft. 3 in. gauge, so that it was a relatively simple matter to alter them back again.

[Reply to " PRECURSOR TANK."]

Double-Headed Trains.

Speaking generally, there are no means of communication between the men on the two engines of a double-headed train. They can, however, signal to one another either by hand or by whistle. The control of the train is in the hands of the leading driver, though the driver of the second engine is required to be prepared for anything that may occur.

[Reply to M. L. B.]

4-4-2 Tank Engines, Great Northern Railway.

Since the 0-6-2 tank engines have taken over virtually all the London traffic working of the Great Northern section of the London and North Eastern Railway, the Ivatt 4-4-2 tank engines have mostly gone elsewhere, a considerable proportion being now employed in the Leeds and Bradford districts and on country branch lines.

[Reply to A. C.]

Midland " Single " Locomotives.

According to the latest returns, 43 of these locomotives still remain in service. We should imagine they would be rather rare in the Manchester district, but between Leeds and London and to some extent on the West of England main line, they are still used for piloting purposes and occasionally in ordinary traffic.

[Reply to E. HUXTON.]

Central Wales Section, London Midland and Scottish Railway.

Apparently your criticism as to the connections with Carmarthen appearing upon the poster maps issued by the London Midland and Scottish Railway are justified. At the same time, these maps are necessarily approximate, owing to the small proportionate scale.

[Reply to R. D. J.]

Maximum Speeds, London and North Eastern Railway, Great Eastern Section.

Mr. H. Margrie mentions that he has recorded three consecutive half miles at 78·5, 81·8 and 76·8 m.p.h. after the 27th milepost approaching Wickford (Southend branch), on the 5.3 p.m. (pre-war timing) ex Liverpool Street, the time from Shenfield to Prittlewell being 20 min. 8 sec.

[Further reply to " L. & N.E.R."]

Anglo-Scottish Train Services.

You are mistaken in suggesting that the Aberdeen–Penzance service was not considered in the article under the above title appearing in the January RAILWAY MAGAZINE. Reference thereto was made on page 50; also to the Glasgow–Southampton and Harwich through coaches.

[Reply to G. TURNER.]

Crossing the Scottish Border.

Messrs. R. H. Baker and " J. A. S." report that the point where Scotland is entered by the East Coast route is marked by a post, on the east side of the line between Ayton and Burnmouth, lettered " England " on one side and " Scotland " on the other.

[Further reply to S. W. S.]

Marseilles-Calais Expresses.

Obviously neither an ordinary nor a special train would run without stop between Marseilles and Calais, so that the remarks to this effect by *The Times* correspondent must be interpreted as meaning that the train was run for through passengers only.

[Reply to F. A. FORBES.]

London and North Eastern (Great Northern) Railway Locomotives.

We understand that three 4-6-2 locomotives have so far been placed in service: Nos. 1470, *Great Northern*; 1471, *Sir Frederick Banbury*; and 1472. We have no information as to any special system of fog signalling in operation on this line.

[Reply to " SUBURBAN."]

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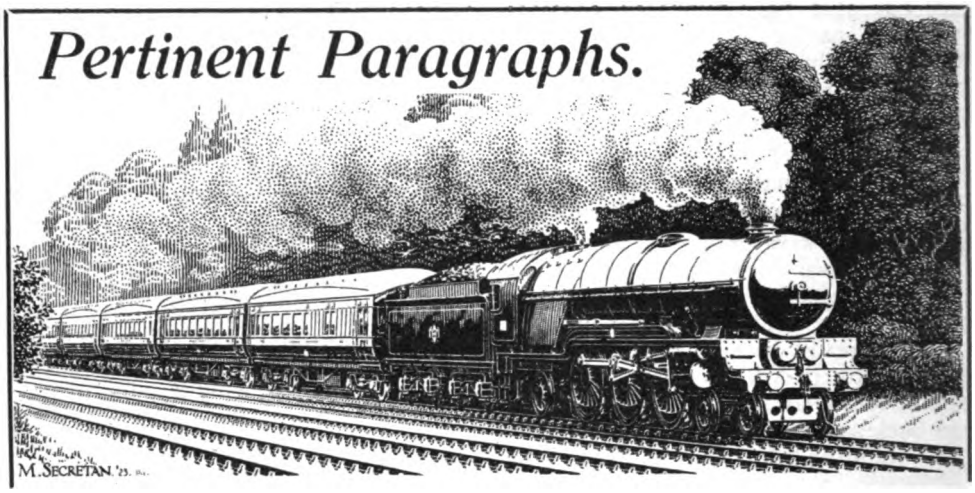
Pertinent Paragraphs.



2-6-0 Locomotive, Dublin & South Eastern Railway.

THIS type, though used on certain other Irish railways, is new to the Dublin and South Eastern Railway. The locomotive illustrated as frontispiece, by courtesy of Mr. George H. Wild, Locomotive Engineer, is therefore of special interest apart from the design which includes several important features. Two of these engines have recently been built by Beyer, Peacock and Co., Limited, of Manchester, for service between Dublin and Wexford. The boiler barrel is of the parallel type, 4 ft. 10 in. diam. outside and fitted with " Robinson " superheater, having 18 elements. The firebox is 6 ft. long and fitted with two " Ross " pop safety-valves, 2½ in. diam. set to blow off at 175 lb. per sq. in. The smokebox is of the extended pattern resting on a cast-iron saddle. The cylinders have a diameter of 19 in. and piston stroke of 26 in. They are fitted with inside admission piston valves, 8 in. diam.

The heating surface distribution is as follows :—

	Sq. ft.
Tubes	952
Firebox	134
Superheater	162
Total	1,248

Grate area is 20 sq. ft. The six coupled wheels have a diameter on tread of 5 ft. 1 in., and the leading wheels, arranged as a pony truck, measure 3 ft. diam. The rigid wheelbase is 16 ft. 1 in. and the engine in working order weighs 48½ tons, of which 42 tons 2 cwt. are available for adhesion. The tender is carried on six wheels, having a wheelbase of 12 ft. Its water-carrying capacity is 2,600 gallons, with 5 tons of fuel, and the weight in working order, 32½ tons. The total wheelbase of engine and tender is 42 ft. 7 in. and total weight of engine and tender 81 tons. The special arrangement of coil springs in groups of three above the coupled wheels will be noted as a feature of the design.

Result of Underground Ideal Car " Competition."

IN the March number the specimen cars built for comparative purposes for service on the London Electric Railway were fully described. It will be remembered that five cars were constructed by various firms to their own specifications, whilst a sixth car was constructed to the " Underground " Company's own specification. It has been decided, after several weeks of practical experience in working these cars in service on the " Piccadilly " line, that the car constructed to the specification of the " Underground " is the most suitable for general service, but certain improvements which were contained in the other firms' cars are to be embodied in what is hoped to be the ideal car. Orders have consequently been placed for the construction of 191 cars at a cost of £710,000—and the manufacture of these will be spread over the following firms :—Cammell Laird & Co. of Nottingham, The Metropolitan Carriage Wagon and Finance Company of Birmingham, and The Birmingham Railway Carriage and Wagon Company of Smethwick. Delivery will be commenced in September of this year and the new trains will be put into service on the

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Moorgate and Hendon extensions of the "Hampstead" tube when this section of the "Underground" new works opens to the public in the autumn.

Suburban Train Economics.

PARTLY arising from the article in the March number on "London Train Services which have Disappeared," several readers have written indicating that, while admittedly changed conditions and the development of other means of transit justify the continued withdrawal of some services, the restoration in other cases would overcome certain drawbacks of travel between districts which (although well served towards the central areas) are often inconveniently situated for journeys between them. The main point is, however, that even when such services were run a considerable proportion of them could hardly justify themselves as paying propositions. This has been the difficulty, in fact, in regard to many of the proposals for "circle" railways connecting the London suburbs. It is true that such services would be appreciated, but the numbers of passengers using them by any particular train have usually been very few. In some instances, in fact, the trains were run primarily for certain specific traffics, such as the interchange of milk vans, &c., the conveyance of passengers being secondary, while in other cases the fact that one or two services were well patronised—as, for example, those conveying workers between a particular residential district and a station near to one or two large works—rendered it justifiable to provide a service spread throughout the day. As a rule, trains pursuing complicated routes and requiring to fit in with standard train services on several sections tend to complicate train working and usually require to be timed relatively slowly so as to be able to fit in at several places.

Altered Traffic Route Possibilities.

ANOTHER aspect of the question raised by certain readers is that of altered traffic routes rendered practicable as a result of grouping. It is true, for instance, that many passengers use trains to a certain terminus, although were through trains provided to another belonging to what was previously a separate railway, but now under the same group ownership, they would appreciate being able to travel to the more convenient station. It does not follow, however, that the numbers of passengers who would use the new facility would be many, in that residential traffic is largely developed upon the lines of facilities offered, and new facilities would have to create their own *clientèle*. Here, again, the question of transferring from route to route and the need for fitting in with other train services would probably render the new services less attractive than those *via* the direct line, while the interworking of trains thus entailed would occur just at the times when the routes concerned were at their busiest. The whole matter, in fact, whether on interconnecting and "cross-country" routes, or of services to other than the usual termini, is one of economics. Would the restored, new or altered services justify themselves or involve merely additional train mileage for the benefit of a few passengers, at the same time complicating train working without materially relieving the standard services, or is it best to provide good facilities on standard routes, leaving passengers to meet their own requirements otherwise by local omnibus or tramway services or by tube and underground railways and omnibuses in the central areas? In the main, railway companies withdraw, alter or inaugurate train services on the basis of carefully prepared statistics and close observation of travel tendencies. Obviously, they can never meet every incidental requirement.

London Suburban Services of the Past.

THE article referred to has also caused several readers to send their recollections of certain services mentioned. As the information is mostly in amplification of Mr. Sekon's article, we cannot do better than reproduce extracts from some of these communications. Mr. G. T. Moody, referring to Midland Railway trains working over the Metropolitan Railway about 17 years after the service was inaugurated, says they were then "in one section only, of 11 close-coupled vehicles, containing 12 first class and 38 third class compartments and weighing 99 tons. They were peculiar in that each compartment had two lamps, while the guards' compartments were not fitted with the end windows and look-outs usual on other companies' trains for similar services. These trains were all built at Derby; most of them in the middle 'eighties, but three of them with more elaborate internal fittings were dated 1897. These trains were superseded, about 1910–11, by 6-coach close-coupled bogie sets, seating six a side, in sections of four and two vehicles. The old trains were then kept for excursion and other odd traffic. Some of the coaches, suitably altered, went to France in 1917 for use as brake vans on the military lines. It may perhaps be noted that the 0–4–4 well-tanks, designed by Mr. Kirtley in 1870 and

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rebuilt some 20 years later, are still to be seen working passenger trains into Moorgate.

"The London and South Western Railway service from Richmond to Ludgate Hill at one time ran on Sundays as well as weekdays, the withdrawal of the Sunday service being recorded in the RAILWAY MAGAZINE for November, 1900. The South Eastern and Chatham Railway Working Timetable for July, 1912, shows the weekday service over this route as follows :—

Down—			
Ludgate Hill	.. ..	dep.	8.29 a.m.
			2.25 p.m.
			5.27 p.m.
			6.25 p.m.*
Up—			
Clapham Junction	..	dep.	7.46 a.m.
Richmond	.. ..	..	1. 9 p.m.
			4. 1 p.m.
			5.14 p.m.

* To Clapham Junction only.

"I am told, although I do not vouch for the accuracy of the statement, that these trains were retained so long because they were extensively patronised by the staff of the P.O. Savings Bank at West Kensington who lived in those parts of South London served by this route. The South Eastern and Chatham Railway also ran an irregular service of trains from Clapham Junction (London and South Western) to the City *via* Brixton; this service disappeared when war-time cuts were made.

"In addition to the London and South Western service from Wimbledon to Ludgate Hill, the London, Brighton and South Coast Railway also ran a service of motor trains from Streatham to Streatham *via* Wimbledon; this also disappeared during the war. Some time previously the Brighton Company ran trains from Wimbledon to London Bridge and Victoria, but when this service disappeared I cannot say."

District—Great Western Trains.

MR. W. E. EDWARDS has recollections that in 1876–7 some of the "Middle Circle" trains, referred to in Mr. Sekon's article, were composed of Metropolitan District coaches, but hauled by Great Western Railway locomotives, and called "Great Western and District trains." He seeks for further information concerning these trains.

Mr. J. Wrottesley suggests that as the late London and North Western Railway was last year running trains between Willesden Junction and Clapham Junction, as well as the "Sunny South Special" through Croydon, it cannot be said that the Willesden Junction–Croydon through service "has disappeared." We confess we cannot follow this line of argument. Trains that work between Willesden Junction and Clapham Junction are not trains to Croydon—they only run 6¼ miles out of the 15¼ miles between Willesden Junction and Croydon, whilst the circumstance that the "Sunny South Special" passes through Croydon cannot be said to constitute a Willesden Junction–Croydon through service. The terminal points of this train are respectively many miles north of Willesden Junction and south of Croydon.

The Broad Gauge at Victoria.

FINALLY the Rev. W. J. Scott, B.A., raises the point as to whether the first Great Western Railway trains to and from Victoria were broad gauge. He writes: "Within four months of the opening of the West London and Victoria service of the Great Western Railway there *were* broad gauge trains on the branch, but the first ones were narrow gauge only, worked by two queer little engines (old West Midland) and named respectively *Volante* and *Voltigeur*. In fact I travelled in one of these trains early in April, '63, which picked up three horse-boxes of the London, Chatham and Dover Railway at Victoria (main platform London, Chatham and Dover) and worked them through at least to Southall."

As Mr. Scott has recollections of the first Great Western Railway trains to Victoria nothing further need be said on the subject, although it would have been possible for a broad gauge train to convey narrow gauge horse boxes. Three horse boxes must have been about the total of the London, Chatham and Dover Railway's stock of these vehicles in April, 1863. It is interesting to note that Sir (then Mr.) J. Fowler, the Engineer of the Victoria Station Railway, reporting in February, 1863, said, "The lines for the broad gauge are now all quite completed and ready for the Great Western traffic at any time." The Great Western Railway service commenced April 1, 1863.

The Fife Coast Lines of the London and North Eastern Railway (North British Section.)

REFERRING to the article under this title, published in the April number, Mr. H. H. Meik sends a cutting from *The Illustrated London News* dated February 16, 1850, showing one of the vessels used at that time for the Granton and Burntisland Ferry, together with the method of transferring railway wagons to and from the vessel. Mr. Meik points out that these steamers were used solely for goods traffic, and had two funnels, except in the case of the *Balbirnie*, which had four, and in the locality was therefore known as the "four legged table."

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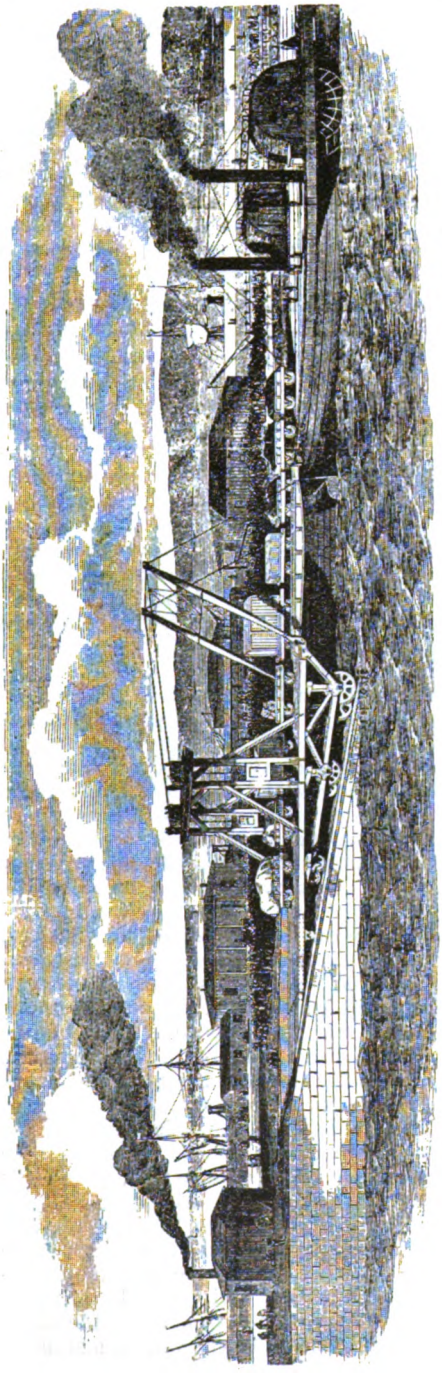
He also mentions that he lived in Edinburgh between 1870 and 1900, and crossed the ferry many times before the Forth Bridge was opened, so that the movable slip and the transfer of wagons often came under his notice. The passenger vessels crossing the Forth were quite different from the goods steamers, the former starting from a different fixed pier and also conveying cattle, light goods and luggage.



"FLOATING FERRY" ACROSS THE FORTH BETWEEN GRANTON AND BURNTISLAND.

The following description of the working of the ferry was given by *The Illustrated London News*: "Alongside the piers at Burntisland and Granton is an incline or slip, constructed of masonry, upon which are laid two lines of rails, the same gauge as the main line. Upon this incline is placed a heavy movable platform, 61 ft. in length, by 21 ft. in breadth, framed of timber, and resting upon sixteen wheels. To the front of the platform are attached, by means of universal joints, four malleable iron girders, 35 ft. long, constructed of boiler-plate, spanning the requisite distance from the platform to the vessel, and affording sufficient depth of water for the keel of the vessel to clear the surface of the slip. These girders are raised and lowered on the arrival and departure of the vessel, by means of a winch on each side of a staging 18 ft. high, erected across the platform. The whole platform, with the girders, is raised and lowered to suit the several heights of the tide, by means of a small stationary steam-engine, which is also employed in moving the trucks off and on board the vessel. The drums and gearing in connection therewith are so arranged as to work the platform, or load and discharge the vessel, with the greatest facility. The vessel can be fully loaded in about five minutes with from thirty to forty waggons, and discharged in about the same time, by the two stationary engines ashore.

"The Floating Railway—*Leviathan*, as the vessel is called—is peculiarly constructed. It being necessary for the waggons to lie all along the deck, it was thought advisable to keep the engines apart, so as to leave the centre clear, and allow the waggons to pass to the stern, for the vessel is so low that the paddle-shafts are several feet above deck; and, had these crossed, as in the usual plan of engines, it would have been a barrier, and only half of the deck could be filled with carriages at a time. By the present arrangement, moreover, of the one engine driving only one paddle, and the other engine the other paddle, the vessel can be put in any position required, without ropes or assistance of any kind from the shore. This is beautifully managed, by working one of the engines ahead, and the other astern.

"The railway and the engines were constructed by Mr. Robert Napier, of Glasgow. Notwithstanding the form and construction is very different from sea-going vessels generally, the whole is finished in the most complete manner, and reflects the highest credit on the abilities of that eminent engineer."

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A British Express Locomotive of 70 years ago.

ON page 353 we reproduce a woodcut from *The Illustrated Magazine of Art* for 1853 illustrating what at that date was considered the summit of locomotive perfection. For the benefit of students of locomotive history the letterpress that accompanied the illustration in the aforesaid periodical is quoted in full, as follows :—

The first pair of the new magnificent express engines for the London and North Western Railway to run to Birmingham in two hours, which were designed by and made to the instructions of Mr. M'Connell, the locomotive superintendent of that company, have been delivered, one from the manufactory of Messrs. Fairbairn of Manchester, and the other from Messrs. E. B. Wilson & Co. of Leeds. These engines have attracted much attention from the excellence and novelty of the design, as well as from the beauty and finish of their workmanship. No pains have been spared by the makers to do full justice to the plans.

The driving wheels of these engines are 7 ft. 6 in. in diameter, the stroke is 24 in. The tubes are 303 in number, and 1¾ in. in diameter, and the fire-box contains 260 sq. ft. of heating surface. These engines are fitted up with Mr. M'Connell's patent solid wrought-iron piston, which, in addition to superior strength and durability, is one-third lighter than those hitherto used ; so that at a speed of 60 m.p.h. a momentum will be saved on the two pistons equal to 80 tons. They have also tubular axles under both engine and tender, which by saving dead weight, and at the same time giving a stronger form, are also not so liable to heat as the ordinary solid axle. This improvement, introduced also by Mr. M'Connell, is rendered complete by the new Indian-rubber springs, which are found to be very easy and durable.

The chief peculiarity, however, in these engines, is the combustion chamber, which Mr. M'Connell has arranged by introducing the fire-box, or direct heating surface, into the cylindrical part of the boiler, to the extent of 4 ft. 9 in. This is a most important step, and will tend to great economy. The result of nine months' trial of an ordinary engine so altered shows a saving of nearly 30 per cent. of fuel used for the work done, and as fuel forms more than half the expenditure, the economy must be very great. As an evidence of the superiority of the method thus employed, it may be mentioned as a remarkable fact that within 45 minutes of the time that the furnace is first lighted, a pressure of steam equal to a hundred pounds on the square inch may be indicated. The estimated power of the new engine when running at a high velocity is not less than 650 horses, and it is confidently hoped that long-sustained speeds of 70 m.p.h. will be obtained. This arrangement Mr. M'Connell has further improved by "recessing" the under part of the boiler for the crank shaft, which lowers the centre of gravity upwards of 10 in.

It is confidently expected that a speed of at least 70 m.p.h. may be sustained throughout their working with great ease, while the steadiness and beautiful action of the machine will render such a velocity quite steady, easy and safe. Steam pumps are attached on the foot-plate, to keep up a supply of water when the engine is at a stand, and a new steam gauge in the form of a gas meter, shows always the pressure of steam with great accuracy to the engine-man.

Isle of Wight—Mainland Connections.

THE absorption of the railways in the Isle of Wight by the Southern Railway has raised again the proposal for a better connection with the mainland system. A train ferry from Cowes is now suggested. A scheme for a tunnel, in which the late Sir Blundell Maple was largely interested, at one time attracted much attention. One end of the tunnel line was to connect with the London and South Western Railway near Lymington, and the other with the Freshwater, Yarmouth and Newport line in the Island. We believe the powers to construct this line have been kept alive.

A train ferry between the Island and the main land for goods traffic was in operation for some years. A company—The Isle of Wight Marine Transit Company—was formed for conveying railway trucks from Langston, on the Hayling Island branch of the London, Brighton and South Coast Railway, to Brading Harbour in the Isle of Wight, where a connection was made with the Isle of Wight Railway. The scheme (which included the reclamation of land at Brading) was financed by the notorious Liberator Building Society. A train ferry steamer, *Carrier*, previously employed by the North British Railway between Granton and Burntisland (see page 416), was purchased for the service. The Marine Transit Company did not prove successful, and in 1886 the London, Brighton and South Coast Railway obtained Parliamentary powers to purchase the whole effects of the Transit Company for £40,000. The purchase was carried out on November 24, 1886 ; the London Brighton and South Coast Railway worked this train ferry for a few years, and then abandoned it. It will be interesting to observe whether under the new non-competitive conditions and unified transport control, another train ferry between the mainland and the Isle of Wight will be installed.

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Old French Locomotives.

Two photographs are reproduced, one below and the other on page 408, kindly sent to us by Lord Monkswell from his collection of views of French locomotives of historical and antiquarian interest. One shows an old "Crampton" locomotive with 7 ft. 7 in. driving wheels in the rear, the design including many features characteristic of Est Railway practice in earlier days. This photograph was taken in 1900. The other view shows a 2–4–0 locomotive belonging to the same railway, the coupled wheels having the large diameter of 7 ft. 7 in., and peculiar in that the cylinders are placed back on the frames to drive the rear coupled wheels. The valve gear is of the Gooch type, with eccentrics placed outside the driving wheels. This photograph was taken in 1898.

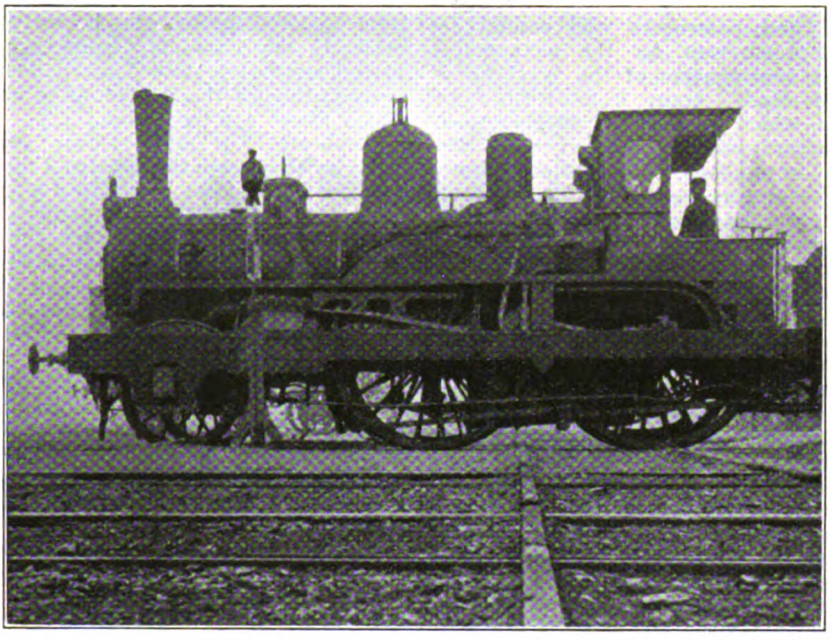

Photo.] OLD 2-4-0 LOCOMOTIVE, C. DE FER DE L'EST. [*Lord Monkswell.*

British Railway Curiosities.

We quite agree that, apart from studies of train services, examination of the pages of *Bradshaw* reveals many interesting points. Some of those to which attention is directed by Mr. H. H. Thorpe, of Stoke-on-Trent, have already received attention in our pages. Thus, in regard to the matter of long distances between stations, some years ago this was dealt with to a considerable extent. For example, we have before referred to the fact that between Bridge of Orchy and Tulloch there is only one intermediate station for public traffic—Rannoch—in a distance of 32½ miles. On other mountain lines in Scotland there are stations many miles apart, though, in a number of instances, there are intermediate crossing places, in some cases provided with private or semi-private stations. Thus, on the West Highland line, there is a private station, known as Gortan between Bridge of Orchy and Rannoch, and another known as Corrour, between Rannoch and Tulloch. To some extent, however, we may expect such conditions on these more remote mountain lines, but to find a stretch of 18¾ miles with only one intermediate station within 70 miles of London, and that on an important main line, is actually much more worthy of comment. This occurs between Basingstoke and Winchester, on the London and South Western main line, Southampton to Bournemouth. From Basingstoke to Micheldever is 10¼ miles, and thence to Winchester 8½ miles. In neither case is there an intermediate station of any kind.

In regard to station names, there are, of course, numerous curiosities, and quite a number of instances where names (particularly where the names of adjacent places are included in the official designations) appear to be unduly lengthy, and the converse of very short titles, such as Eye, Quy

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and Par. With regard to other points raised by our correspondent, we may explain that "Baff" Saturdays are those intermediately between fortnightly pay Saturdays in certain colliery districts. For obvious reasons these require different train facilities from those directly adjacent to pay day.

There are numerous instances where it is announced that certain trains will not convey heavy luggage, bicycles, &c. It is generally in order to avoid complicating station work which may cause delay, and to prevent the necessity for running additional vans on trains which are fully loaded with passengers, and which it is desired to expedite as far as possible. Where "accommodation is limited" it is usually due to the fact that for certain reasons no additional vehicles will be attached, and passengers who cannot be conveyed must wait for the next train. Thus, the continuation of the West Coast "Limited Mail" train from Euston to Aberdeen, which becomes a passenger train from Larbert when combined with the 4.15 a.m. from Glasgow (Buchanan Street), conveys passengers from Perth to Aberdeen only "if room," a strictly limited number of passenger vehicles being added to the mail vans in view of the fast schedule given to this train and its importance.

It is by no means unusual to find principal trains which, when they reach relatively unimportant sections, call at nearly every station, mainly owing to the fact that the running of a slow train in connection would not be justifiable, or that through passengers may require to use any or every intermediate station.

There are a number of instances where trains will be run if there are sufficient passengers, these usually being late connections which have no local value. Similarly, in quite a number of cases, trains will be extended beyond their ordinary destinations if there are sufficient passengers. To understand these and other arrangements one necessarily requires to have knowledge of the local conditions.

"Cup Final" Traffic on the Metropolitan Railway.

In order to meet the exceptional traffic requirements anticipated by the "Cup Final" at Wembley Park, for which the great "Stadium" erected in connection with the British Empire Exhibition to take place next year has been completed, the Metropolitan Railway has built an up-to-date station, completed in a very short time. The lay-out of the station includes six wide platforms, aggregating over 2,500 ft. in length, all served by staircases averaging 15 ft. in width. These staircases lead to a commodious circulating area, which will subsequently connect with a large covered way taking the passenger direct into the Exhibition grounds, under cover all the way.

Station buildings are of a substantial character and are constructed of red and blue brick; the booking hall and offices have been tastefully finished in oak, and artistic glazed tiles are used for the walls. Nineteen booking windows have been provided to deal expeditiously with return traffic, while freedom of movement has been prepared for in every way. All-electric signalling is being installed, and this, coupled with an ingenious track lay-out, will enable the "Metro" to handle abnormal traffic smoothly.

For the Cup Final a special time-table has been prepared, trains being booked to arrive every 1½ min., enabling more than 30,000 passengers to be handled in an hour. The journey time of the fast trains to and from Baker Street will be 10 min.

Duplicate "Up" and "Down" lines from Finchley Road give the "Metro" the advantage of clear tracks for non-stop trains in both directions, whilst a continuous service of trains will run between City and other stations to Baker Street where easy connection will be made with the special service of trains to Wembley Park. Special trains will also be run from Aylesbury, Wendover, Chesham, &c.

The whole of the "Metro" organisation is being "tuned-up" for the occasion, and in addition to the work carried out at Wembley Park, extensive improvements and alterations are also in evidence throughout the company's system. At Baker Street station additional entrances and exits have been made in the main circulating area to facilitate movement of passengers, and a new entrance, complete with booking office, provided on the south side of Marylebone Road, to cope with the huge crowds anticipated, and to enable passengers to enter the station without crossing the road. In addition to this a special booking office will be opened in the carriage-way solely for issue of tickets to Wembley Park. Alterations have also been made in connection with the signalling system in order that greater frequency and added efficiency may be obtained. The signalling sections between Baker Street and Wembley Park have been considerably shortened and no less than 17 new sections introduced between these points.

Reduced fares from every point on the "Metro" system will be in operation on Cup Tie day, one shilling between Wembley Park and Baker Street, Edgware Road, Paddington, Great Portland Street and Euston Square, whilst the fares from other "Metro" stations will be proportionately

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low. Every available train will be pressed into service on Cup Tie day and many of these will comprise eight cars.

Some Further Notes on the Leamington and Coventry Line (L.M. & S.R.)

Mr. G. W. BISHOP writes:—"Warwick (Milverton) Station has had the platforms raised to modern height, the structure being of wood. The old 'London and Birmingham' buildings still remain on the up side. The engine shed appears to have returned to its old state of a sub-shed to Rugby (G.W.). For a time it had a separate number, but the train service on the Rugby and Leamington branch has been increased, which may partly account for the alteration. Additional trains have also been put on to certain stations on the Leamington and Daventry branch. Local memories of the collapse of Leek Wootton bridge in 1861 have lately been revived, and a local picture house threw on its screen a reproduction of a pen-and-ink sketch that is still preserved. The engine involved seems to have been a McConnell 0-6-0 goods engine, with 5 ft. 6 in. wheels and long boiler.

"The season-ticket holders' entrance on the up side of Kenilworth station has now been converted to a general passenger entrance, with a new pathway to the main waiting-room. The station has been thoroughly repaired and painted, and looks very well, bearing out the title of 'the handsomest station in Warwickshire,' given in the RAILWAY MAGAZINE many years ago. A siding near by has a notice-board stating the classes of engines allowed upon that piece of line. A considerable amount of timber is loaded at Kenilworth, and special wagons and cranes are often to be seen there. The famous *Cornwall* has been seen on this section, with an inspection saloon, her brass dome presenting a novel appearance. One of Mr. Webb's 4 ft. 6 in. tanks, No. 760, has been lately working local trains. These are rather rare now, most of the survivors being on motor-trains.

"The 'Coat of Arms Bridge,' near Coventry, seems to be an object of interest, judging by the number of picture postcards it inspires. This bridge carries the line over a roadway at Stivichall. The coat-of-arms carved upon it is that of Mr. A. F. Gregory, through whose estate the line was made. A scheme for doubling the line was proposed very soon after the opening in 1844."

TRAVEL BY 'METRO' TO THE CUP FINAL
SATURDAY 28TH APRIL 1923
BOLTON WANDERERS v WEST HAM
SPECIAL RETURN FARE FROM THIS STATION TO WEMBLEY PARK
1S 0D
'METRO' STATION ACTUALLY ADJOINS BRITISH EMPIRE EXHIBITION GROUNDS
QUICKEST, MOST DIRECT AND CONVENIENT ROUTE
METRO STATION
BAKER STREET STATION, LONDON, N.W.1
R. H. SELBIE, General Manager.

NEW POSTER ISSUED BY THE METROPOLITAN RAILWAY IN CONNECTION WITH THE FOOTBALL CUP FINAL AT WEMBLEY.

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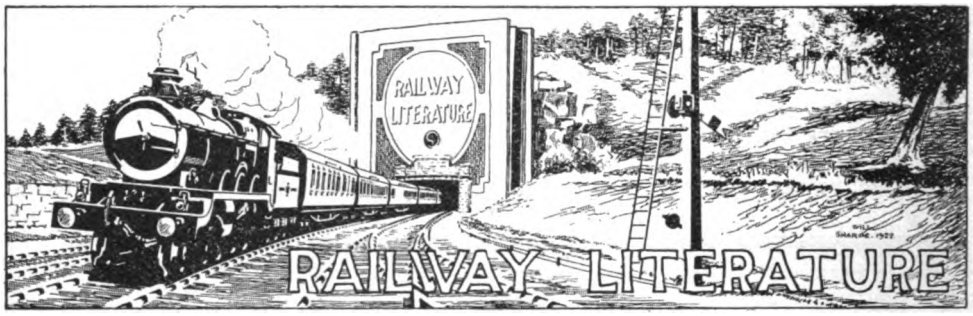

THE RAILWAY YEAR-BOOK FOR 1923. [London: 33, Tothill Street, Westminster, S.W.1. Price 5s. net. By post, 5s. 9d.]

Few will be found to dispute the authority of the old French proverb that asserts "there is no necessary man," but when it comes to books, assurance assumes a less dogmatic attitude, for without doubt there are reference works that must be regarded as indispensable, and the *Railway Year-Book* is not the least of them.

First published in 1898, the new edition for the year 1923 is the twenty-sixth of its line, and its advent is heartily welcome in those multitudinous and widespread circles accustomed to consult its pages when railway facts and figures are in question. In addition to its sub-title, "The Whitaker of the Railway World," the *Railway Year Book* has a great reputation to maintain, and it is evident that in the compilation of the 1923 edition, which consists of over 400 pages and contains some two dozen maps, every effort has been made to conserve each useful feature in the valuable mine of railway information the book provides, and at the same time to present to its subscribers details of all the latest developments, consequent upon the operation of the Railways Act of 1921, which became effective as from January 1, 1923. In form and arrangement this new edition of the *Railway Year-Book* differs greatly from all its predecessors, but by critical examination it is disclosed that in the rearrangement of the scope of the book all that is essential has been retained and everything that is requisite and necessary has been incorporated. Take, as examples, the special articles describing the London Midland and Scottish, London and North Eastern, Great Western and Southern Railways; the analyses of joint, leased and worked railways as affected by the new railway situation; the fuller traffic and operating data in the statistical sections; and the systematic information in regard to the steamships, docks, harbours, &c., now grouped under four great ownerships. The maps, too, will be appreciated by students of railway geography, as well as by business men and all who have dealings with the railway systems, not only of the British Isles, but also of the dominions overseas and in South America.

Special mention may be made of the following items:—Government Payments to British Railways; Allocation of the Government Compensation Grant to Irish Railways; a new section on Permanent Way and Structure Dimensions, &c.; new statistics of Numbers of Railway Employees; Signalling Statistics of Principal British Railways; Analyses of Railway Facilities in 1922; Comparisons of British and Foreign Express Train Services; Capital of the New Railway Companies; and important alterations and additions to the section devoted to Societies, Institutions, Clubs, &c. In the biographical portion the change is particularly noticeable, and for this reason, if no other, all those who desire to know "Who's Who" in the railways of the British Isles will find the book invaluable.

It is impossible in a short notice to describe in detail every useful feature possessed by a reference work of this character, but suffice it to say that the book is indeed a *vade-mecum* for the railway officer and one without a compeer or a rival for railway shareholders, directors, staff, engineers, manufacturers, Government officials, military men, and for politicians both in and out of Parliament. In addition to the foregoing there is a very considerable section of the general public animated by the desire to be kept well informed on railway questions and to these the *Railway Year-Book* may be recommended with every assurance that each and every one who subscribes to the book will find abundant recompense for his modest outlay. Of course, an annual of the character of the *Railway Year-Book* could not be compiled without the active aid of leading railway officers, and the publishers express gratitude for the cordial co-operation and assistance rendered, often under circumstances of great difficulty in view of the vital and essential changes in progress.

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MR. A. J. HILL, C.B.E., who has retired from the position of Chief Mechanical Engineer of the Great Eastern Railway, has throughout his career been associated with Stratford Works. He entered the service in 1877, passing through a course of training in the workshops and drawing office of the Locomotive Carriage and Wagon Department at Stratford, obtaining a Whitworth scholarship in 1882. He was appointed, in January, 1899, Works Manager, and became, in 1912, Locomotive, Carriage and Wagon Superintendent, and in 1915, was given the title of Chief Mechanical Engineer. Mr. Hill has always taken interest in the educational aspects of railway engineering training. While Works Manager he was Chairman of the Committee of the Great Eastern Railway Mechanics' Institute (where apprentices and others receive a large proportion of their technical education) for many years, while he has given the support of his office to various other technical institutions in the district. Mr. Hill is a member of the Institution of Civil Engineers, to the proceedings of which he contributed papers on "The Use of Cast Steel in Locomotives" and "The Repairs and Renewals of Railway Rolling-Stock." For the first-named he received a Miller prize, and for the last a Watt medal and a Crampton prize. He is also a member of the Institutions of Mechanical and Locomotive Engineers. Mr. Hill has been largely responsible for the extension of the ambulance movement on the Great Eastern Railway, acting for many years as Honorary Secretary to the company's corps. By force of circumstances, Mr. Hill has not been responsible for any locomotive designs of outstanding importance, weight and other restrictions preventing the introduction on the Great Eastern Railway of locomotives of exceptional size and power, while a great part of his term of office included the war and immediate post-war years. Moreover, conditions at Liverpool Street station and the general traffic requirements of the line have rendered it necessary to provide locomotives of moderate dimensions, though of considerable power, and there has been little call for exceptional rolling-stock developments. For size, however, the 1500 class of 4-6-0 locomotive, as developed and improved by Mr. Hill, constitutes an exceptionally suitable and useful design, which has fully justified itself, not only for performance but also in regard to economy of fuel consumption and in respect of maintenance and upkeep costs. The large superheater goods locomotive, although six-coupled only, ranks as an exceptional design which also has fully justified itself. The 0-6-2 tank engines for heavy suburban traffic may also be mentioned, as also the rebuilding and reconstruction of locomotives of older class. Under Mr. Hill's control, considerable extensions have been made to Stratford Works, notably the new engine repair and carriage shops, while workshop methods and plant have been extensively remodelled and modernised, and special attention given to improved shop progress systems.

Elliott] [*& Fry.*

Mr. A. J. HILL, C.B.E.,
Chief Mechanical Engineer,
Great Eastern Railway, 1915–1923.

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MR. A. E. HICKS, who has been appointed Docks Traffic Superintendent, Great Western Railway, entered the service in the Divisional Telegraph Superintendent's office at Taunton. He was transferred to the Divisional Traffic Superintendent's office at Cardiff in 1893, and spent the next 12 years between that office and the Assistant Divisional Superintendent's office at Newport. Promoted to headquarters in 1905, he gained extensive experience in several departments in the office of the Superintendent of the Line. From August, 1914, to June, 1917, he was in the Great Western Railway military transport office, being appointed Chief Clerk to the London Divisional Superintendent in July, 1917. At the termination of the war, Mr. Hicks returned to the office of the Superintendent of the Line to take charge of the freight trains operating section which had to be completely reorganised on the cessation of hostilities. Mr. Hicks represented railway operating interests on the recently-appointed Joint Investigation Committee to inquire into the working hours of the tippers and trimmers at the South Wales ports. Mr. Hicks is located at Cardiff.

* * *

ONE of the principal functions of the office of the High Commissioner for India in London is the purchase of plant and stores for the Indian State-managed and other Government departments, so that special interest is felt in railway manufacturing circles in the appointment of Mr. Dadiba Merwanjee Dalal, C.I.E., to the office in succession to the late Sir W. S. Meyer. Mr. Dalal has taken up his post as from April 18. Born of Parsee parentage in Bombay in 1870, Mr. Dalal has for many years been one of the leading authorities on Indian finance.

* * *

COMPETITIONS for the Highland Ambulance Challenge Cup and medals, and the Park Ambulance Challenge Cup, were held at Inverness station on March 31. The Highland Cup Competition was open to teams of five men each, in the employment of the Highland section of the London Midland & Scottish Railway, while the Park Cup, which has been presented by Mr. Robert Park, ex-General Manager of the Highland Railway, was competed for by the best individual member of each team in the company's Cup Competition. For the Highland Railway Cup teams competed from Perth Locomotive, Aviemore, Inverness Locomotive (3), and Inverness station (2), Inverness Locomotive, Team A, scoring the highest marks, closely followed up by Inverness station, Team A, and Perth Locomotive. For the Park Ambulance Cup for individual competitors, Mr. A. Scott, of the Carriage and Wagon Department, was declared the winner. Mr. Scott was also captain of the winning team in the Highland Railway Cup Competition.

* * *

QUITE out of the ordinary was the concert given at Queen's Hall, Langham Place, by the Great Eastern Railway Musical Society on "Boat Race" night. The occasion was the 119th concert, completing the 15th season, of the Great Eastern Railway Musical Society, which, since its formation in 1908, has attained a high reputation. The orchestra, recruited principally from the London district, joined forces with the London, Norwich, Cambridge and Ipswich Male Voice Choirs, but there were also contingents from the staffs of the Great Central and Great Northern sections. Thus assembled under the baton of Colonel William Johnson Galloway, Hon. Conductor of the Society, there were about 100 in the orchestra and 230 picked voices in the choir. The programme was of high quality throughout. Miss Agnes Nicholls and Mr. Robert Radford were the soloists. The former rendered the scena "Ocean! Thou Mighty Monster," from "Oberon" (Weber), with wonderful clarity. In the second part Miss Nicholls sang the Bach-Gounod setting of "Ave Maria," accompanied by harps (Messrs. J. T. Cockerill and H. Stephenson) violin (Mr. P. Lewis), and organ (Mr. Sydney Harrington, F.R.C.O.). In each case encores followed. Mr. Robert Radford was associated first with the Male Voice Choir, orchestra and organ in the Triumph Song from "Salamis" (Gernsheim), also singing "The Calf of Gold" from Gounod's "Faust," giving as an encore Clark's "The Blind Ploughman," with pianoforte accompaniment and organ obligato, while in the second part, Stanford's Three Cavalier Songs for male voice choir, baritone solo and orchestra were given. The orchestra opened with a fine performance of the "Ruy Blas" Overture (Mendelssohn), their other solo items being "L'Enfant Prodigue" Suite (Wormser), in which many delicate orchestral effects were obtained, the always popular ballet music from "Faust" (Gounod), the Coronation March from "Le Prophete," Sibelius's "Valse Triste," and the Prelude to Act I from "Carmen" (Bizet). Last, but far from least, in that the choral contributions ranked among the great successes of the concert, the Male Voice Choir rendered, with accompaniment, the well-known chorus from "Israel in Egypt" (Handel) for two bass parts, "The Lord is a Man of War," joining also with Mr. Robert Radford in items already mentioned, while splendid results were obtained with several unaccompanied part songs.

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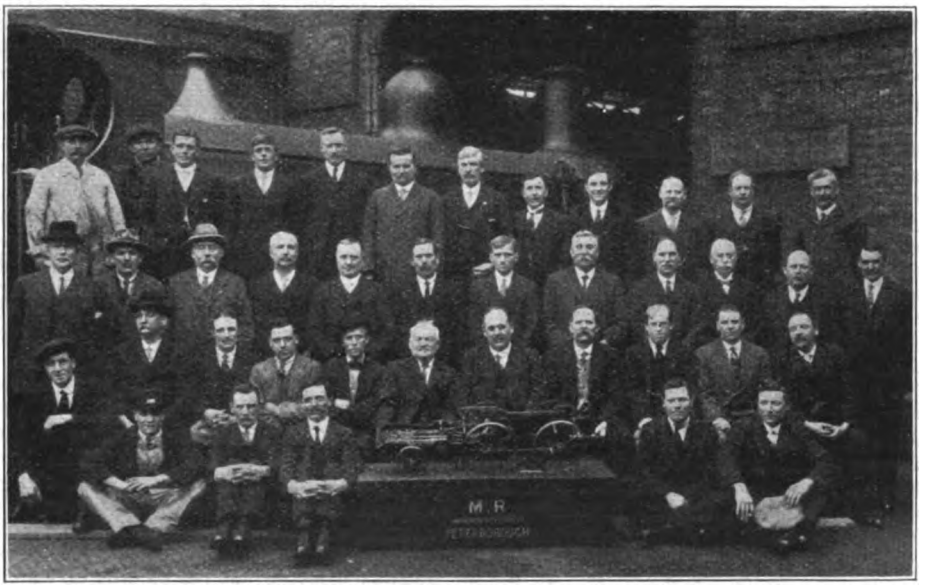
During an interval in the concert reported in the foregoing paragraph, Mr. S. A. Parnwell, Divisional General Manager, Southern Area, London and North Eastern Railway, while regretting the absence of Lord Ailwyn, proposed a vote of thanks to Sir Hugh Bell for taking the chair. He expressed the opinion that the harmony they had heard was symbolic of the spirit which pervaded all grades of the railway service, and he trusted that the social harmony which the Society had done so much to foster in the ranks of the Great Eastern Railway would benefit equally the staff of the London and North Eastern Railway. He also extended a cordial welcome to Mr. Wedgwood and other chief officers who had come among them. Sir Hugh Bell, in thanking Mr. Parnwell for his kind remarks, caused some amusement by saying that "You Southern people want to teach us rugged and inhospitable Northerns the real basis of civilisation by the soothing charms of music. You hope, and I hope, that the North will become milder and the South, perhaps, a trifle more rugged; at any rate that this new conjunction between the South and the North which we have now entered upon will be good for all." He offered, on behalf of those who had recently joined, their congratulations upon the musical entertainment given. The cover of the printed programme was the work of Mr. B. C. Dix, a member of the technical staff of the Mechanical Engineering Department, Stratford, adjudged best of 23 competitive designs. Necessarily the organisation of a concert on such a scale entails a great deal of work, in which connection the services of Mr. A. W. Headley, Hon. Orchestral and General Secretary, the Divisional Choral Secretaries, Messrs. G. Keary, O.B.E., A. A. Ashman, W. R. Cook and F. G. Cob, the Hon. Librarians, Messrs. E. S. Green and J. V. Gosling, and others merit acknowledgment. Press arrangements were under the personal direction of Mr. W. M. Teasdale and Mr. E. A. Evans.

* * *

THE group illustrated on this page represents Peterborough Motive Power Mutual Improvement Class of the London Midland and Scottish Railway. This class is one of 51 held by drivers, firemen and cleaners over the Midland division. They are voluntary and self-supporting, and held entirely in the men's own time, usually on Sundays, in mess rooms, institutes and waiting rooms, the use of which is granted by the company. Subjects discussed are those connected with the working of the locomotive engine and the various duties appertaining thereto. The members of these classes number over 4,000.



PETERBOROUGH MOTIVE POWER MUTUAL IMPROVEMENT CLASS.
London Midland & Scottish Railway (Midland Division).

* * *

A LECTURE and debating society has been formed at Liverpool Street station, London and North Eastern Railway, and at the first

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meeting about 200 members were present. The chair was taken by Mr. H. F. Hilton, Superintendent's Department, who submitted the proposed constitution and rules, which were adopted. Mr. S. A. Parnwell (Divisional General Manager) was elected President of the Society, and Mr. A. C. Ladell, Liverpool Street station, was appointed Hon. Secretary. Mr. A. Woolford, F.R.P.S., Divisional Mechanical Engineer, Ipswich, then gave a lecture entitled "Some Interesting and Beautiful Architecture in the East Anglian District of the London and North Eastern Railway," illustrated by a large number of lantern slides from the lecturer's photographs. The lecture was well rendered and afforded much pleasure to the audience.

* * *

A VALUABLE contribution to the monthly lectures at the Railway Club, 65, Belgrave Road, S.W. 1, was that recently given by Mr. W. J. Mitchelhill on "Electric Lighting, Heating and Cooking on Railway Trains." The lecturer, who has had practical experience of his subject, dealt in an authoritative manner with the present systems and various points were elucidated in the discussion which followed. On May 11, at 7.30 p.m., Mr. E. Wallis, will present a paper entitled "Various Systems of Signalling on the London, Brighton and South Coast Railway," and on Friday evening, May 25, there will be an exhibition of photographs and postcards at the club. In addition to the officers elected for 1923 recorded in the April RAILWAY MAGAZINE, the following were re-elected :—Mr. H. W. Bardsley, hon. librarian ; Mr. M. D. Greville, hon. steward.

* * *

IN connection with the Institute of Transport, the fourth dinner will take place at the Savoy Hotel, London, on the evening of Thursday, May 3. Ladies are to be invited. The Institute will hold its third Annual Congress at Sheffield on Thursday, Friday and Saturday, June 14, 15 and 16. The mornings of the two first days will be devoted to the reading and discussion of papers and the afternoons of those days and the Saturday following will be taken up with visits to places and works of transport interest. An attractive programme has been arranged. Full details will be available shortly. An influential Congress Committee has been formed. The Local Honorary Secretaries are :—Messrs. W. H. Causer (London and North Eastern Railway), J. Smith (London Midland and Scottish Railway) and W. H. Breach (Aire and Calder Navigation), and their addres is London Midland and Scottish Railway, Wicker Station, Sheffield.

AN example of the irresistible fascination of the railway, and everything connected with railway operation, over the general public, both young and old, was afforded on Tuesday, April 10, when an audience of 300 gathered in the Hall of Christ's College, Finchley, in order to hear a lantern lecture by Mr. Cecil J. Allen, A.M.Inst.T., A.I.Loco.E., entitled, "Our Railways." The audience was composed chiefly of public-school boys, the lecture being under the auspices of the Finchley branch of the Crusaders' Union, but parents and friends were also present in considerable force. Mr. Phillipson, M.A., the Headmaster of Christ's College, was in the chair, and introduced the lecturer. Mr. Allen concentrated chiefly on the engineering side of railway construction. After a brief historical outline, he traced, by means of some informative diagrammatic slides, the considerations, geographical and otherwise, which govern railway planning, and then illustrated the principles dealt with by a series of photographs of outstanding engineering works, concluding this section with an exceptionally fine set illustrating the extraordinary engineering difficulties surmounted by the engineers of the St. Gothard Railway of Switzerland. From this study of civil engineering Mr. Allen proceeded to take up the development and design of the steam locomotive, following on with similar details in regard to coaching stock, in which he took pains to point out the heavy cost of increased haulage per passenger conveyed which railways have to bear, in order to provide the comforts of modern travel. The lecture, which was listened to throughout with close attention over the space of some two hours, concluded with some slides illustrative of points of interest in connection with modern railway working, such as picking up water and exchanging mails *en route*, signalling, and the safe working of single lines, and so on. During the past winter Mr. Allen has also lectured on similar lines at Dulwich, Upper Tooting, Tulse Hill, Crouch End, Hampstead and Stockton-on-Tees.

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USERS of model railway accessories are asked to note that the new address of The Forward Model Co. (proprietor, F. P. Ward), is Cobnar Road, Woodseats, Sheffield.

* * *

IN the House of Commons, Mr. Collison asked the Chancellor of the Exchequer if he would state the estimated cost of providing Members of Parliament with free railway passes to their constituencies. Mr. Baldwin replied : "On the basis of the week-end fares at present in operation which are available from Friday (by trains leaving

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London at and after 5 p.m.) until Monday, it is estimated that the cost of free travel for Members of Parliament by railway or steamship between London and their constituencies would be approximately £60,000, if the House met 40 weeks in the year."

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In reply to a question addressed to the Parliamentary Secretary to the Ministry of Transport, Colonel Ashley replied: "I cannot give an approximate date by which the Tooting Junction line may be electrified. I am aware that the line was formerly operated jointly by the London and South Western and London, Brighton and South Coast Railways, but I would point out that the lines of those companies and of the South Eastern and Chatham now form part of the same undertaking. I am informed by the Southern Railway that the suggestion that a new station should be established at Streatham Road will be considered in connection with the electrification scheme, and that it is not intended to reopen this line by employing steam haulage."

* * *

Escalators are costly installations. The London Underground Company have placed contracts recently for escalators at Moorgate Street, costing £42,574, and at Shepherd's Bush for £21,709. The huge scheme of new works on the Underground also provides for escalators at Clapham Common, Clapham Road, Stockwell, Oval, Old Street, Oxford Circus, Bond Street, Tottenham Court Road, Bank, Trafalgar Square and Elephant and Castle. These improvements will cost altogether nearly a million pounds.

* * *

From the Ministry of Transport comes the intimation that the first annual report of the Railway Rates Tribunal for the year 1922 has been published, and is at sale price 1s. per copy, at H.M. Stationery Office.

* * *

On this page is illustrated one of the Lancia armoured cars that have been converted for use on the railways in Southern Ireland. The cars are worked by men in the Labour Corps of the Irish National Army. They are used chiefly for protecting workmen engaged in the repairing of bridges and also to deal with irregulars who may be lying in ambush to attack passenger and goods trains.

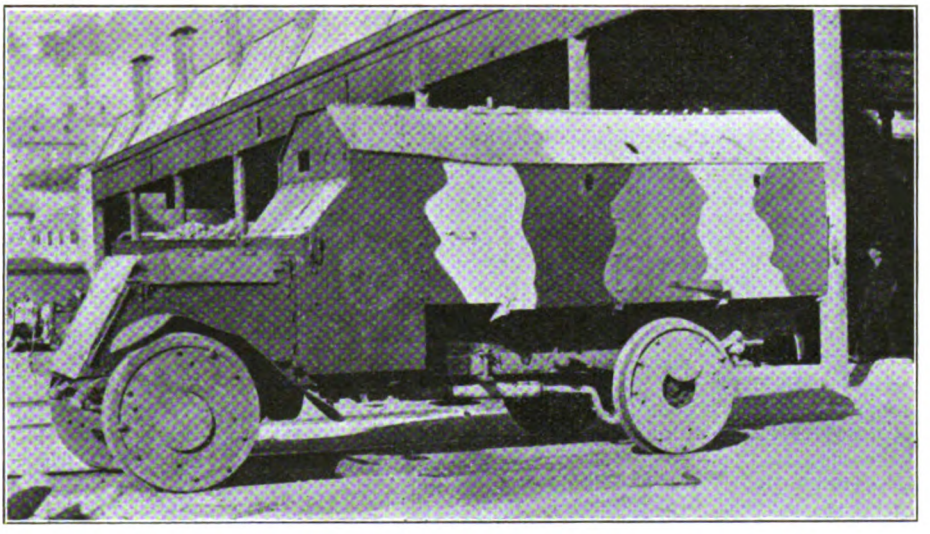

Photo.] [*Rex. Murphy.*

AN IRISH ARMOURED CAR FOR RAILWAY RESTORATION WORK.

* * *

All Easter records were broken this year by the trains, omnibuses and trams of London's Underground Group. It is estimated that during the four days' holiday over 16,000,000 passengers were carried. Easter Monday alone accounted for 5,000,000. On the railways, the traffic to Southend-on-Sea, Richmond, Kew and South Harrow, was exceptionally heavy. Hampstead and Golder's Green Stations broke all previous records, with 24,000 extra passengers on Easter Monday.

* * *

Railway Magazine readers will be interested to learn that the London and North Eastern Railway steamers will resume their

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sailings from Harwich to the Belgian Coast on July 2. The steamers will leave Harwich on Mondays, Wednesdays and Fridays on arrival of the Continental Pullman and restaurant car express. In the reverse direction the vessels will leave Zeebrugge Mole on Tuesdays, Thursdays, and Sundays. This will be found a most convenient and comfortable route for visitors to Blankenberghe, Ostend, Heyst, Knocke, &c., and the interesting old Flemish centres, and as the steamers cross during the night, hotel expenses will be saved. Through restaurant car expresses will be run between Liverpool, Manchester, Sheffield, Glasgow, Edinbrugh, Newcastle, York and Harwich, as well as through carriages between Birmingham and Harwich in connection with the arrival and departure of the steamer. This route offers special attraction for the "week-ender." He can leave on Friday night, spend a full day at one or more of the coast resorts, or at Bruges, or in visiting the Ypres Salient, and be back in London in time for business on Monday morning or in the principal Midland and northern towns in the afternoon.

* * *

FOR some 18 months or so the London Underground Electric Railway Company has been experimenting with a travelling daylight cinematograph theatre, which it is proposed to send on tour through the Home Counties. The theatre is composed of a L.G.O.C. bus chassis mounted on giant pneumatic tyres. On the chassis is fitted a dynamo and projector room. The pictures are projected behind the screen. When in use as a theatre the sides are constructed so as to enable their being extended on the lines of the bellows of a folding camera. This arrangement enables the minimum amount of sunlight falling on to the screen. The audience stand round at the back of the vehicle, and several hundred can thus obtain a first-class view of the pictures. Considerable difficulty was experienced in obtaining a satisfactory screen which would show a sharp picture on strong sunlight. The screen now in use is the invention of Mr. John Bulman. It is about 5 ft. square, and at a short distance looks too small for its purpose, but, as a matter of fact, it is quite ample. Despite the daylight, the pictures came out with remarkable clearness. They were chiefly scenes of London life. Many of the pictures have been taken by the photographic section of the Underground, and in some respects they are unique, being the first of their kind. At a recent Press exhibition of the theatre, Mr. Ivor Fraser, of the Underground Publicity Department, explained that it is only proposed to show pictures of real educational value, and, judging by the requests which have been made for performances by the rural districts, there is every prospect of this novel free entertainment being extremely popular during the summer.

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THE revised colour scheme now adopted by the Great Western Railway for its passenger coaches is being applied to its road vehicles, and black lettering on a white background is replacing the former gold lettering on a red ground.

* * *

STUDENTS of the evolution of Great Western locomotive design will note with interest that the tapered chimney now in favour on that line is a reintroduction from approximately 20 years ago. A chimney of similar appearance to that now in use was fitted to the "Camel," "Atbara" and "City" types in 1900 and 1903.

* * *

MR R. A. HARDY, of Poole, Dorset, reports that a special train of 10 new coaches on trial trip ran from Eastleigh to Dorchester and return recently. These vehicles, which were constructed by the South Western Section of the Southern Railway at the Eastleigh Works, are all vestibuled and are of the latest type introduced in the summer of 1921. This stock will be employed in the Waterloo–Bournemouth services, and formed into two set trains of five coaches each, each train comprising a bogie third brake, bogie third, bogie first, bogie third and bogie third brake, and weighing approximately 170 tons when empty. Pantry cars are not provided in these new set-trains, neither do they, at present, bear a set-train number.

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FROM Morecambe, Mr. H. R. Stones sends the following items which he thinks will interest other RAILWAY MAGAZINE readers :—

(1) 4-6-0 "Prince of Wales" superheater, No. 964, *Bret Harte*, has been rebuilt on the lines of the Lancashire and Yorkshire Section Hughes' 4-6-0; being fitted with link motion, but with inside cylinders. I noticed this engine recently at Camforth attached to the 8.25 a.m. Carlisle to Euston on a trial trip.

(2) Precursor tank, 4-4-2 wheel arrangement, No. 1572, has made its appearance at Lancaster (Castle Station), having been repainted in the old London and North Western colours, but in place of the coat of arms of the late company, and "L. & N.W.R." painted on the side tanks, it has "L.M.S." painted in their places. This is the first engine I have seen on the Section A of the Western Division with "L.M.S." painted on. No. 1572 is attached to Lancaster Shed, 27 L. and works trains on the Morecambe Branch.

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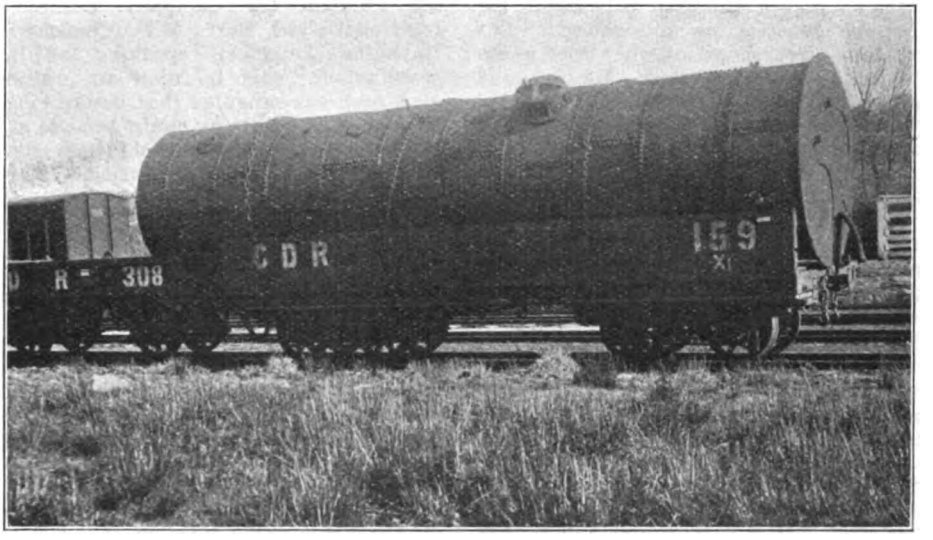
A BIRMINGHAM reader mentions that, on two or three occasions recently, London and North Western trains have been worked into New Street station, Birmingham, by North Staffordshire locomotives. He also claims to have seen a Caledonian locomotive in the Birmingham district, though, as this was on the Midland section, we would suggest that what he saw was a Somerset and Dorset engine.

* * *

To Mr. H. Forbes, Secretary and Traffic Manager, County Donegal Railways Joint Committee, we are indebted for the photograph reproduced below, illustrating one of four 10,000-gallon oil tanks carried recently by the Donegal Railways for oil installations in County Donegal. The line is laid to the 3-ft. gauge.



A BIG LOAD ON AN IRISH NARROW GAUGE RAILWAY.

* * *

MR. R. AINSWORTH, writing from Bolton, on April 8, remarks: "Noting in the new L.M.S. time-tables that the 2.10 p.m. Sunday train Manchester (Victoria) to Preston has now been blessed with a through carriage to Glasgow, may I pass a few remarks about this and the corresponding train in the other direction, both of which I happened to see on the first occasion on which they ran as now timed. The 2.10 p.m., with its 'Through Carriage' (singular) in effect consisted of two corridors and a dining-car for Glasgow, with a through carriage, Manchester to Edinburgh (Princes Street)—four London and North Western coaches in all, with a decrepit-looking Lancashire and Yorkshire set of five vehicles for Blackpool and two Midland vans. As the Blackpool journey involves a wait at Preston of 1 hour 36 min., its value is rather questionable. The return 'Through Carriage' from Glasgow, due in Manchester at 4.35 p.m., turned out to be almost a train in itself. Six London and North Western corridor coaches, including a dining car with a Caledonian bogie van, were at the rear of five Blackpool Lancashire and Yorkshire carriages, all headed by one of the ubiquitous 2-4-2 tanks, which seemed to have a little more than it could comfortably manage with twelve coaches behind it."

* * *

IN addition to the above, Mr. Ainsworth further expresses himself as follows:—"One wonders why it is a habit in the Lancashire and Yorkshire Section time-table department never to use the term 'Express.' Are the Lancashire and Yorkshire officials afraid such a term would be incongruous as applied to any of their trains? However, these self-same through carriage legends blossom out into the more effective designations of luncheon and dining-car expresses after Preston is reached, on the Carlisle line. Evidently, the Crewe authorities have the courage of their own convictions. If for no other reason than its publicity value, one would imagine a railway company would advertise the facilities it offers, lavishly, rather than by minimising them, or merely hinting that such facilities do exist. After all, showmanship ought to be just as valuable in the preparation of a railway's time-tables as in the presentation of its posters to the public."

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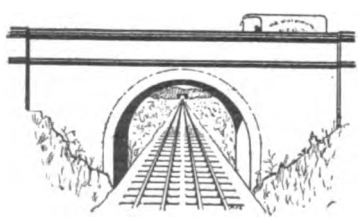
TWELVE years have passed since the Great Western Railway ceased to provide second-class compartments on their passenger trains, but the absorption of the Barry, Brecon and Merthyr, Rhymney and Taff Vale Railways, under the Act of 1921, has again brought the question to the front, those railways having retained the intermediate class. The Great Western now announce their intention to abolish, as from July 1, second-class accommodation on this section of their system, and the occasion will mark the complete disappearance of the second class on railways forming the Western Group.

* * *

BRITISH readers will be pleased to learn of the important contract secured by William Beardmore and Co., Limited, of Glasgow, for the supply, construction and equipment of the general workshops of the Portuguese South and South Western Railway at Barreiro. A point is that the competition was free and open to contractors in all countries, each firm being invited to send in its own design of buildings and general layout. There was thus very severe competition from other British firms as well as Continental concerns, including many in Germany. The workshops are for the construction, maintenance and repair of locomotives, carriages, wagons and rolling-stock generally, required in connection with this railway system. When completed, the establishment will comprise—erecting shop, foundry, machine shops, tool room, carpenters' shop, paint shop, paint mill and store, material store, boiler shop, forge and smithy, finishing shop, coppersmith's shop, carriage and wagon shop, upholsterers' shop, timber shed, pattern shop, and will be the largest building of its kind in Portugal. The present shops have to be demolished to make way for the new buildings, but the contract calls for the work of the railway being carried on in the old shops while the new shops are being built, and the transference of old plant and the installation of new plant being carried out in such a way that the repairs and upkeep of railway plant will not be interfered with. The buildings have to be equipped with the most modern electric fire installation. Diesel motor and generator, overhead cranes, air compressor plant, and for the power station, mechanical coaling appliance capable of coaling two locomotives at one time, reinforced concrete water supply tank, dock pump, &c., will be provided. Rails, points and crossings have also to be provided, for direct access to the different shops and for the intercommunication between each shop, and in order to facilitate the rapid handling of the work to be undertaken. The shops are designed on the most modern lines, and will be an excellent example of the most modern railway workshop layout and organisation.

* * *

AT the recent ordinary general meeting of the Pullman Car Company, Limited, Sir Davison Dalziel, Bart., M.P. (Chairman and Managing Director), speaking of future development, said he took an optimistic view and was sanguine that before long the Pullman Car Company might become as far-reaching an institution in British railway affairs as was the International Sleeping Car Company in relation to the railway system throughout the whole of Continental Europe. An entirely new experimental expansion would be made in July upon the London and North Eastern Railway, when a new and complete Pullman Limited train would be put into service daily between London, Leeds and Harrogate. This train would consist of first and third-class Pullman cars only, and would be scheduled to do the run in record time. He added, with reference to the arrangements made by the board for altering the capital conditions of the company, that it had been decided to pay off the outstanding issue of £500,000 8 per cent. equipment debentures at 102½ and to replace them by an issue of £625,000 7 per cent. preference shares of £1 each. By the creation of these shares the capital of the company would stand at £1,125,000. There would be no debentures outstanding, while the book value of the rolling-stock alone would substantially exceed the total issued capital. The interest on the preference shares was approximately covered twice over by the net operating revenue.



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A NIGHT SCENE AT CARLISLE.
Liverpool and Manchester Express ready to start.

Notable Railway Stations and their Traffic.

CARLISLE (CITADEL), LONDON MIDLAND AND SCOTTISH RAILWAY.

By E. M. SANDERS.

AS a border city, guarding the western approach to Scotland, Carlisle has always occupied a strategic position, and although the seven railway companies previously using it are now reduced to two, it provides all the interest of a great railway junction, Carlisle being, in every way, a centre of great importance from the railway point of view. Hence, although it has on more than one occasion received attention in the pages of the RAILWAY MAGAZINE, there is every justification for consideration again.

The original station was built by the London and North Western and Caledonian Railways, and consisted of one through platform and two bays. Other companies converging upon Carlisle each had their separate stations, which were for the most part where their present goods depôts are now situated. The Newcastle and Carlisle Railway, now part of the London and North Eastern Railway, was the first to enter Carlisle, and this railway was soon followed by the Maryport and Carlisle, these companies having their own stations at London Road and Crown Street respectively.

In the days before railways ran into Carlisle, there was a canal from the city to Port Carlisle, eleven miles to the west on the Solway Firth, and it was along the bed of this canal that the Carlisle and Silloth Railway Company elected to lay their line. The waterway at this time was not by any means paying its way, so when the water had been drained out, the railway was laid to its Carlisle terminus at the canal basin to the west of the city. When the North British Railway entered Carlisle, they took over the Carlisle and Silloth, with the result that the locomotive and carriage sheds of the North British Railway are still at the canal basin. This accounts for the fact that the North British

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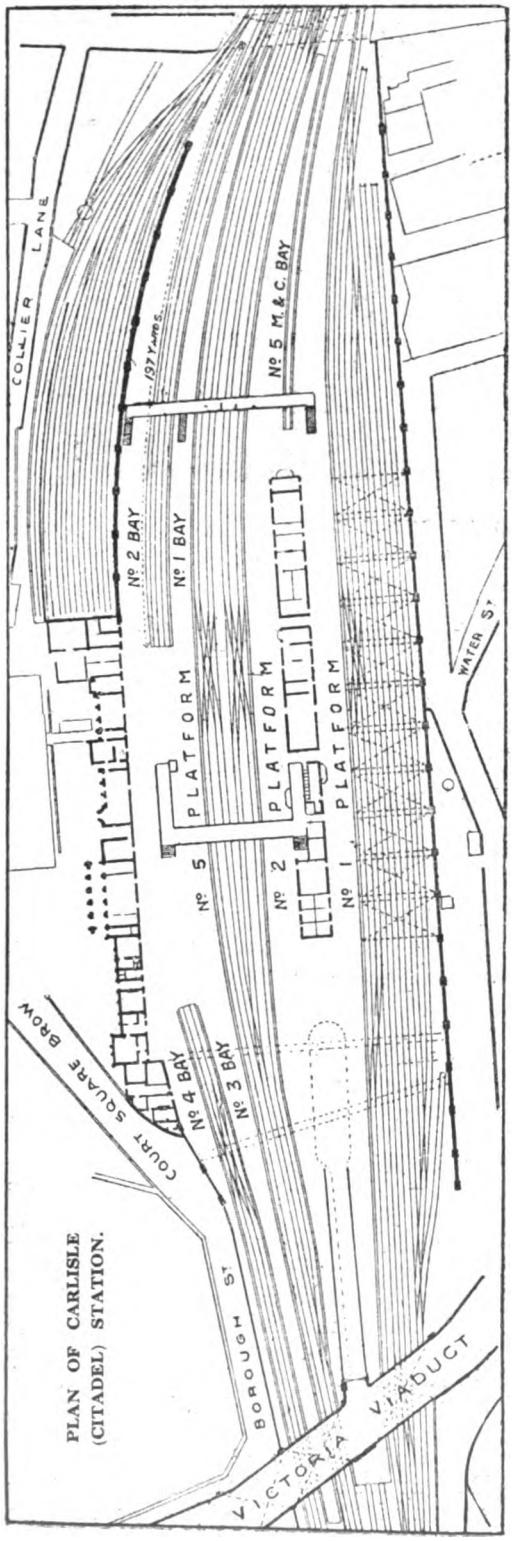

PLAN OF CARLISLE (CITADEL) STATION.

diverges from the Caledonian and Glasgow and South Western lines to the west, the North British "Waverley" route crossing over the Caledonian main line about three-quarters of a mile to the north.

The gradual admission of the other companies to the Citadel station caused great congestion, as all the goods traffic was as yet passing through it, and so in 1873 the station was entirely rebuilt, and a new line to the west constructed to meet the requirements of the rapidly increasing goods traffic. The station now covers an area of ten acres, and has eight platform roads, which together measure 2,284 yards in length. The longest platform is No. 5, which is 454 yards long, which length is often required, as two long express trains frequently have to be dealt with at the same platform. The total area of the platforms is 2¼ acres.

Although its two ends face, in reality, roughly north-west and south-east, it will be convenient to consider the station as facing north and south, and its two sides as the east and west sides. The station is situated in a convenient position in the centre of the town, facing on to the spacious Court Square, through which most of the tramway routes of the town pass. On the east side of the square, with covered communication from the station, is the County and Station Hotel, which, though standing on land owned by the Citadel Station Managing Committee, is let to an independent company.

The Booking Hall is entered by one of three arches, but to the right of these there is a separate arch through which luggage may pass. On each side of the Booking Hall are the booking windows of the respective companies and sections. The Maryport and Carlisle had its booking office on platform 2, where also are booking offices for use in connection with trains starting from the west side of the station.

Beyond the arch leading from the Booking Hall is a large circulating area, on which are various fruit and tobacco stalls. Placed also in conspicuous positions are indicators showing the times and platforms of departing trains, and also a board indicating the times, etc., of excursions and any other special trains. As no vehicular traffic enters the station on the east side, this circulating area is

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entirely given up to passenger and luggage movements, and so is free from all overcrowding.

On the left of the entrance, extending up to No. 2 bay, as seen on the plan, reproduced on the opposite page, are first and third-class waiting rooms, refreshment rooms and gentlemen's and ladies' lavatories. Beyond this, also, is a lamp room. On the right, a waiting room, the station master's offices, a parcels' office, a large cloak room and a telegraph office. Commencing opposite to, and continuing beyond the left luggage office, is No. 4 bay, which is extended for some distance under the viaduct which spans the northern end of the station. Communication with platforms 1 and 2 and No. 5 bay is afforded by a wide and substantial bridge, which is approached on the southern side by an inclined way, up which bicycles and perambulators may be wheeled, and on the other by steps. A little to the south of this bridge is a large luggage lift, by means of which access is given to a subway below the level of the rails. By this subway luggage is transported from one side of the station to the other, and near the lifts are facilities for labelling luggage, etc.

Crossing the bridge, we notice that between platforms 2 and 5 there are two running roads, narrowing into one at the northern end. Those at the southern end are used by engines waiting to take on expresses, and by coaches and dining cars ready to be attached to trains. There are crossovers from these lines to the platform roads at the end and also in the centre of the station. At the bottom of the slope on the other side of the bridge are boards indicating the punctuality or otherwise of the trains on the various lines. These are also to be found in a prominent position on platform 5.

To the south of the bridge is a block of buildings extending down the platform to No. 5 bay, comprising first and third-class buffets, waiting-rooms, a left-luggage office, a parcels office, a bookstall facing on to platform 1, and the Maryport and Carlisle booking office. To the north is a bookstall facing on to platform 2, gentlemen's and ladies' lavatories, a telegraph office, a large luggage room, main line booking offices, and a parcels post office. There is also a booking office on platform 1. Between the telegraph office and these booking offices are the lifts corresponding to those on platform 5. Beyond platform 1 are five roads, used for storing and marshalling passenger trains, crossovers being provided from the platform line to the nearest of these at the northern and southern ends of the station.

As has already been mentioned, at the

CARLISLE (CITADEL) STATION, FROM MAIN FOOTBRIDGE, LOOKING NORTH.

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northern end of the station there is a viaduct bearing one tramway line and considerable traffic, which crosses all the lines of railway, and the platform which comprises the platform lines Nos. 1 and 2 and No. 5 bay is connected by an inclined roadway with this viaduct. On the platform there is sufficient room provided for vehicles to turn round and also for three or four vehicles to stand. Near the southern end of the station there is another bridge, not so wide as the main one and approached only by steps, spanning Nos. 1, 2 and 5 bays, as well as the main platforms.

round to the west, is the Maryport and Carlisle section. It may be noticed here that the Glasgow and South Western locomotive sheds are situated to the south of the station, on the Maryport and Carlisle line.

Ignoring for the moment changes produced by grouping, let us now consider the uses to which the various platforms are put. No. 1 bay is used for Midland local traffic, though London and North Western and North Eastern trains work into it when not otherwise in use. Bay No. 2 is given up almost entirely to North Eastern traffic, and is used for

CARLISLE (CITADEL) STATION, LOOKING NORTH.

The station roof, which covers six and a quarter acres, is carried by twenty-six deep lattice girders, about 40 ft. apart, these supporting a series of cantilever beams. The whole is glazed with Mellows glazing. No part of the station is therefore at all dark. At the south end of the station, on the left, is the London and North Western goods depôt, and on the right the Maryport and Carlisle goods yards. On the east side of this end of the station are the North Eastern lines, over which Midland trains run as far as Durran Hill Junction. In the centre, rising considerably, in order to cross over the goods lines from the Newcastle line, is the London and North Western main line, and on the right, curving sharply

both arriving and departing trains. The traffic of No. 3 bay is divided fairly equally between the three Scottish lines, but No. 4 is used almost exclusively for the Silloth traffic of the North British, excursion trains on this line frequently being of considerable length, hence the extension of the platform under the viaduct.

The numbering of the main platforms is, at first, rather confusing. Nos. 1 and 2 are on each side of the island platform on the west of the station. The two running roads are then assumed to be Nos. 3 and 4, thus making the other main platform No. 5. This platform is the up West Coast through platform. Here all the West Coast expresses from the north are dealt with, as well as several

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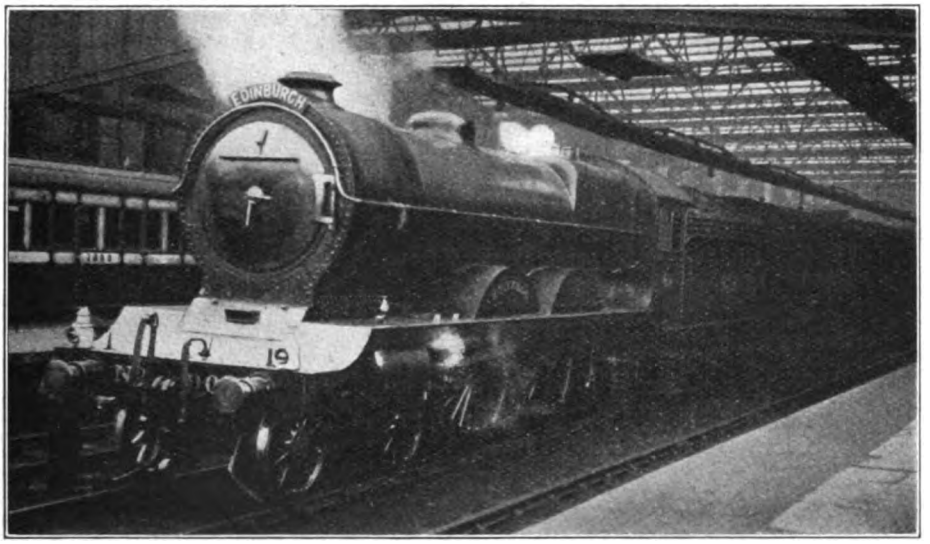
up London and North Western expresses which start from Carlisle.

Crossing the bridge, platform 2 is reached. This is the up and down through Midland, North British and Glasgow and South Western platform. Here nearly all the expresses to and from Edinburgh and Glasgow, *via* the Midland route, are dealt with, and as both the up and down expresses use the platform, it is often the scene of great animation. Several Glasgow and South Western and North British trains also use this platform when not in use for through traffic. No. 5 bay is used solely for Maryport and Carlisle traffic; as this is only a single line bay, the engines of arriving trains must remain in the platform till the train is unloaded and ready to back out. At all the other bays, crossovers are provided to allow for the exit of the engine if required for other purposes. No. 1 is the down through West Coast platform at which all the down West Coast expresses are dealt with, also several down London and North Western trains which terminate at Carlisle.

A feature about passenger train working at the Citadel station is that the arrivals and departures of the chief Anglo-Scottish expresses fall naturally into three groups, and it is therefore at these times that the station is at its busiest. The first period falls between the hours of 12 noon and 2 p.m.; between these hours four up West Coast Anglo-Scottish expresses are dealt with at platform 5, three being for Euston and one for Liverpool and Manchester. From platform 2, three up Midland Scotch expresses and one down express are despatched, whilst two down West Coast trains are due at platform 1. The second group of expresses commence at 3.45 p.m., and are dealt with at the platforms in much the same way as the first group.

A writer once remarked that Carlisle station was busier at midnight than at midday. It is shortly after midnight that the third and largest group begins to besiege the Citadel station; at the up West Coast platform four sleeping car expresses arrive and depart, and similarly at the Midland platform three up expresses are dealt with. As soon as these up "sleepers" have left, the earliest down trains begin to arrive, commencing with the 7.30 p.m. from Euston, reaching Carlisle at 2.14 a.m. These continue throughout the early hours of the morning, the last sleeping car arrival being the 11.40 p.m. from Euston, due Carlisle 6.40 a.m. During the tourist season some of these trains are duplicated and additional ones run.

The fact that a railway builds up its



LONDON & NORTH EASTERN (NORTH BRITISH) 4-4-2 LOCOMOTIVE WAITING TO TAKE ON EDINBURGH EXPRESS.

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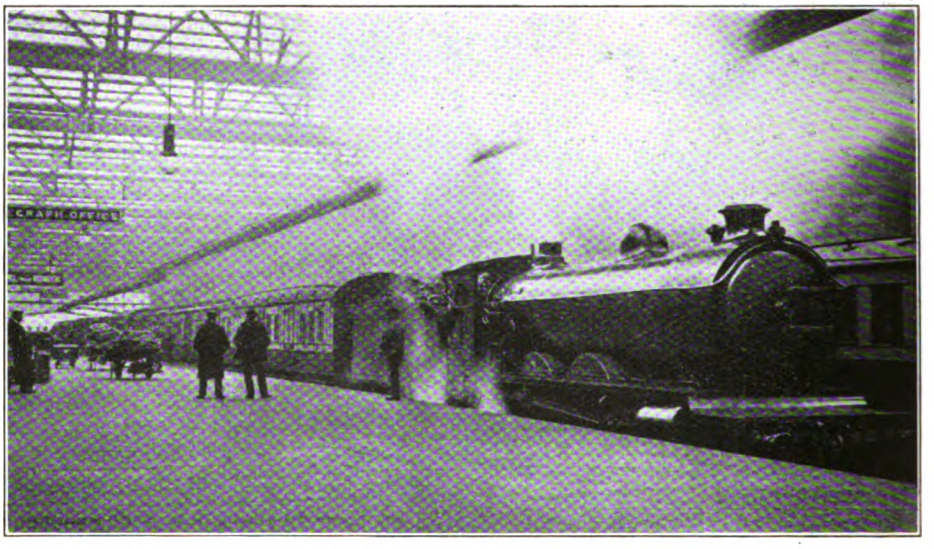
local traffic by the service it gives is well demonstrated at Carlisle. No one who had regular business in Carlisle ever thought of living more than two miles at the most from the centre of the city. The North Eastern and Maryport and Carlisle came to Carlisle, and with increased accommodation on entering the Citadel station at once provided good local services. To-day it is on these lines that most local traffic enters and leaves Carlisle station. It is also noticeable that these two lines have a local service on Sundays.

The North Eastern has frequent express trains, stopping at only four or five stations, between Carlisle and Newcastle; and during the summer months there is a through train to and from Silloth, using the North British line between Silloth and Carlisle. There is also in each direction a midnight express running non-stop between the two cities, partly for conveying through coaches to and from Stranraer, but chiefly for the accommodation of the milk traffic between Cumberland and Newcastle, and for mails.

A service which forms an important part of passenger train working at Carlisle station is the Liverpool and Manchester to Glasgow trains. Though these are not always recognised as forming a considerable part of the Anglo-Scottish expresses, nevertheless they provide an excellent service. Restaurant car expresses give arrivals at Carlisle from the south at 12.45 and 3.25 p.m., from which trains passengers may in both cases change at Carlisle into the express following for Perth, Aberdeen, etc.; the Liverpool and Manchester proceeding to Edinburgh and Glasgow. In the up direction similar arrangements exist, there being a sleeping saloon for Liverpool (Lime Street) on the 11.10 p.m. from Glasgow.

In pre-war days excursions and cheap tickets received much attention by the various railway companies at Carlisle, and these facilities are beginning once more to grow to their pre-war dimensions. Silloth, on the North British line, is a favourite resort for excursionists, and on any summer Saturday several excursions may be run to that place alone. On the North Eastern line, Wetheral (4½ miles), How Mill (7½ miles), and Brampton Junction (11 miles from Carlisle), attract a great deal of pleasure traffic, so much so that the out Sunday evening train, and the corresponding return train, are duplicated as far as Wetheral in the summer months. Keswick and Penrith (for Ullswater) provide abundant pleasure traffic for the North Western route, there being a through coach from Keswick to Carlisle, *via* Cockermouth and the Maryport and Carlisle line twice daily.



WEST COAST EXPRESS AT No. 1 PLATFORM.

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Signals and points at Carlisle are controlled by three main boxes, viz., No. 5 Box (114 levers), No. 4 Box (56 levers), and No. 4A (40 levers). As will be seen, No. 5 is the largest box and controls the south junction. Here, during the busy times, one movement of points and signals is made, on an average, each minute. No. 4A is in the station itself, and controls all signals and points within the station, whilst No. 4 is at the northern junction, controlling movements at this end of the station.

Carlisle station being essentially a joint station, since the trains of what were seven companies use it, is managed by the Citadel Station Joint Committee. The station is at present under the able superintendency of Mr. Nicol Campbell, M.B.E., whose offices are in the station. Mr. Robert M. Thomson is secretary to the Citadel Station and Carlisle Goods Traffic Committees.

Mr. NICOL CAMPBELL, M.B.E.,
Station Superintendent,
Carlisle (Citadel) Station
Joint Committee.

Mr. ROBERT M. THOMSON,
Secretary,
Carlisle (Citadel) Station and
Carlisle Goods Traffic Committees.

Although the Citadel station is on the whole well planned and easy to work, there are one or two details in the lay-out of the lines approaching the station that are at times inclined to be rather inconvenient. For example, up and down Midland expresses have to cross the path of up West Coast expresses, which frequently leads to delays when one or other of the trains is late. The accommodation for North Eastern trains is rather limited now, with the addition of several new trains, sometimes causing delays outside the station owing to the platform lines being occupied. The reader will by this time have gathered that the station is rather small in proportion to the traffic with which it has to deal, and this is certainly the case.

Whether the grouping of seven companies into two will materially affect the train services at Carlisle remains to be seen, but one thing is certain, that so long as railways in Great Britain exist as they are to-day, Carlisle must necessarily be one of the chief connecting links between English and Scottish services, and will always rank as one of the most important exchange and traffic centres in the British Isles.

Mr. Nicol Campbell, M.B.E., Superintendent at Carlisle, entered Caledonian service at Edinburgh as a porter, passing through various grades until appointed assistant stationmaster at Rutherglen on

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the opening of the underground lines in Glasgow. He was then transferred to Greenock (Central) in the same capacity, afterwards becoming chief inspector, night stationmaster, and (14 years ago) Superintendent to the Carlisle (Citadel) Station Committee. Mr. Campbell was awarded the M.B.E. in 1919 for war services rendered during the period when the traffic associated with Gretna Munition Factory, and the tremendous troop and other traffic passing through Carlisle, added so greatly to his responsibilities.

Mr. Robert M. Thomson has held the positions of Secretary to the Citadel Station Committee and Carlisle Goods Traffic Committee since 1907, while in 1916 he was also appointed Secretary to the Carlisle Joint Control for the regulation of goods traffic of the seven companies then associated at Carlisle. Mr. Thomson entered railway service at Carlisle in 1883 as a clerk in the booking office. In 1885 he was transferred to the secretary's office of the Portpatrick & Wigtownshire Joint Railway and Larne & Stranraer Steamship Committee, returning to Carlisle in 1907 as above mentioned.

SUPPLY TRAINS ON A GREAT AMERICAN RAILWAY.

IN ATTENDANCE ON THE SUPPLY TRAIN.

On the Atchison, Topeko & Santa Fe Railway "supply" trains are operated regularly over every division for distributing station supplies, engineering equipment, collecting scrap and surplus material, etc. From 10 to 18 of these trains are engaged, usually on 30-day schedules.

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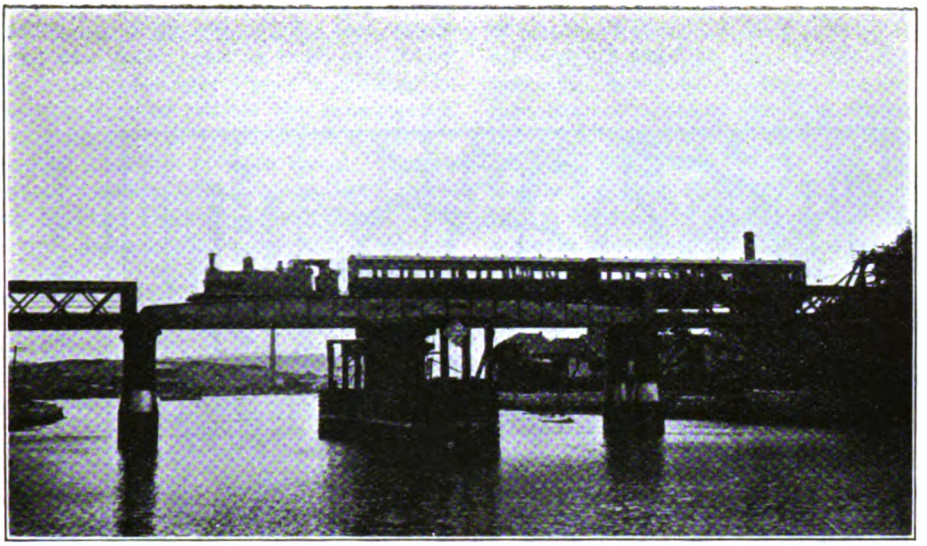

MOTOR TRAIN ON SWING BRIDGE OUTSIDE TURNCHAPEL STATION.

The Plymouth Lines of the London and South Western (Southern) Railway.

By J. F. GAIRNS.

(*Photographs, except as noted, by the Author.*)

"GREATER Plymouth" consisting of the "Three Towns" of Plymouth, Stonehouse and Devonport, combines the triple characteristics of a large industrial town, a centre of naval operating and constructive activity, and an ideal holiday resort, though the last fact is not so widely realised as it should be. It is pleasantly situated on the peninsula formed between the Hamoaze (the estuary of the Tavy and Tamar) and the Cattewater, serving Sutton Pool, the Old Harbour, and leading to the Plym, from which Plymouth takes its name.

In the old town of Plymouth, in Stonehouse and in the naval town of Devonport, also in many of the districts further back, there are many manufactories, and Plymouth as a whole is primarily an industrial, naval and shipping centre and the headquarters of a considerable fishing fleet. Its population is, therefore, by no means a small one, and there are many pleasant residential districts within town limits, towards the heights behind it, and fringing the waterways which are "Plymouth's Glory," while Devonport, with its dockyards and associated premises, maintains naval importance upon a scale which could not have been contemplated by the "sea-dogs of Devon" who did so much to make history in Elizabethan days.

As a touring centre, however, Plymouth provides interest to a degree which is equalled or excelled by few holiday resorts. The famous Hoe, claimed to be the finest promenade in the world, is a source of continual interest. From these heights, laid out with wide promenading areas, stepped paths, green lawns and flower gardens, as a setting for Smeaton's lighthouse (re-erected on the Hoe when the present Eddystone lighthouse displaced it after 160 years' service), the Armada Memorial and the Drake statue, the visitor has spread before him the expanse of Plymouth Sound dotted with craft of all kinds, sail, steam, petrol and the humble rowing boat. Warships, torpedo boats, submarines and

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MAP OF SOUTHERN (LONDON AND SOUTH WESTERN) RAILWAY LINES APPROACHING PLYMOUTH AND IN THE PLYMOUTH DISTRICT.

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launches are constantly to be seen, while almost every day sees at least one if not more large passenger liners anchoring in Cawsand Bay, or within the breakwater, for the purpose of trans-shipping passengers and mails to or from Great Western Railway tenders which have "put out" from Millbay Docks to meet them. On the one hand are the heights of Mount Edgcumbe and on the other Mount Batten and Staddon Heights; in the foreground is Drake's Island, and on a clear day in the far distance can be seen the present Eddystone lighthouse, 13 miles or so out to sea. To the left is the Citadel, and to the right Millbay Harbour and Docks (Great Western Railway), Stonehouse Pool (London and South Western Railway) and Mount Wise, glimpses also being had of the Hamoaze on the one side and of the Cattewater on the other, while in all directions, except out to sea, are to be seen the high lands of the hilly and picturesque country around Plymouth.

To meet the needs of the modern holiday maker, there is, too, a promenade pier below the Hoe whence steamers make the famous and exceptionally beautiful trip up the Tamar to Calstock, a great fruit centre, and to Morwell Rocks at Weir Head; to the River Yealm, past the breakwater and round the Mewstone, a great mass of rock to the east of the entrance to Plymouth Sound; to Cawsand Bay and out to the Eddystone. Trips are made to Mount Edgcumbe Park on days when the beautiful grounds are open to the public. Great Western Railway steamers also run from Millbay Docks to the Eddystone lighthouse, while there are numerous steamer, motor-boat and ferry services from various parts of Plymouth, Stonehouse and Devonport to places across the water, some only a short distance away, but requiring a considerable detour by land, many being picturesque and well worthy of a visit, though the cost of reaching them may be only a few pence. On the Pier is a fine concert hall, while there is an open-air pavilion on the Hoe, a marine laboratory and aquarium adjoins the citadel, and a good service of electric tram cars runs from the Pier round the base of the Hoe and thence to all parts of the "Three Towns."

In many other ways, too, Plymouth has much to commend it as a holiday centre, but special mention may be made of the splendid series of bathing houses built into the rocks below the Hoe adjacent to the Pier, used by hundreds of men and women, boys and girls, who, in fine weather, disport themselves merrily in the water, frequently displaying considerable aquatic prowess and constituting a never failing source of interest to visitors. Plymouth is well served with hotels and boarding houses adjoining the Hoe and in the town itself, while in the Guildhall, St. Andrew's Church, the public library and the museum, the tourist will find much of interest. The town is also a good centre for motor coach tours, of which a large variety is provided during the summer months.

These remarks will indicate that Plymouth has to be considered not only as an industrial and naval centre, but also as a holiday resort; it is however, the railways with which we are particularly concerned, though it has to be remembered that the railway facilities are designed mainly to meet the commercial and transport needs of a town of considerable business importance and having a large residential population. Much is done, however, to cater for summer visitors.

Of the railways serving Plymouth the Great Western is necessarily the more important in that it provides the shortest routes to and from London, while the town is itself on the western main line and therefore gets the benefit of the full train services thereon. Several main and branch routes are also concerned. In the case of the London and South Western Section of the Southern Railway, however, there is only the main line from Okehampton and Tavistock to Devonport, the connection from the Great Western Railway to Laira Junction and so to Friary, and the branch to Oreston and Turnchapel, except that goods lines and connections are given to Sutton Harbour on the one side and to Stonehouse Pool on the other. The Plymouth services too, constitute, in the case of the London and South Western lines, only a portion of the west of England main line services, and thus do not benefit from services which, in the case of the Great Western Railway, require trains to be operated for traffic other than that actually pertaining

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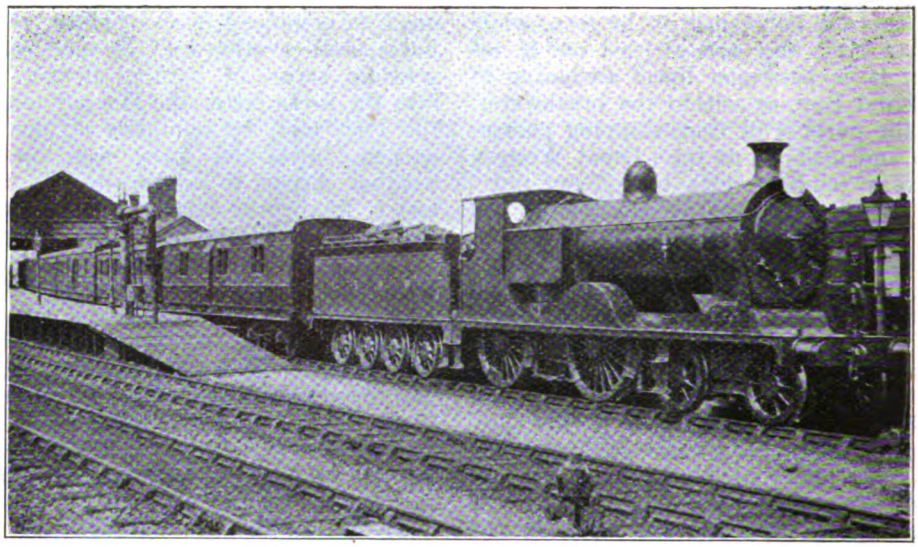

Photo.] DOWN TRAIN AT NORTH ROAD, PLYMOUTH. [*T. J. Pearce.*
4-4-0 Locomotive No. 397.

to Plymouth. Considerable interest attaches, however, to the London and South Western lines in the Plymouth district, and to the train services and facilities thereof, as will be seen.

In the February, 1917, RAILWAY MAGAZINE, the writer described briefly the London and South Western Railway route to Plymouth. It is now necessary to consider in somewhat greater detail the lines concerned, particularly in the Plymouth district itself.

It will be recalled that although London and South Western trains had been running to Plymouth since 1876, the South Western station at Devonport being then known as the "Narrow Gauge" station, the route until 1890 was via the tortuous and severely-graded single line branch of the Great Western Railway from Lydford Junction via Yelverton to Marsh Mills, laid with the "mixed gauge" to accommodate London and South Western trains, and joining the Exeter-Plymouth line at Lydford Junction, thus reaching Plymouth from the east. The construction of the Plymouth, Devonport and South Western Junction Railway altered this entirely, the route from Lydford to Devonport direct being immeasurably superior to that via Yelverton. Incidentally, when opened on June 1, 1890, London and South Western trains were given access first to Devonport and then to North Road station, Plymouth, reversing the previous direction of running. Even to-day, so far as passenger traffic is concerned, London and South Western trains from Exeter deposit nearly all their passengers at Devonport, North Road and Mutley stations, the continuation of the route to Friary terminus not usually being very busy on the passenger side.

The Southern Railway has, however, considerable interests on the east of Plymouth, and for goods traffic these lines are important. A part of the old Plymouth and Dartmoor Railway, built to run from a place called Crabtree, not far from Plymouth, to Princetown, is incorporated in the present Princetown and Tavistock branch of the Great Western Railway. The London and South Western Railway Company owns the short section between Cattewater Junction and Plymstock stations, while in 1878 an agreement was made between the Plymouth and Dartmoor and London and South Western Railway Companies "for the working of the railways of the company (Plymouth and Dartmoor) for communicating with the Cattewater (Plymouth) and the quays and manufactories thereat." In 1882 these lines were vested in the London and South Western Railway Company which, there-

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fore, was given access to the Cattewater Harbour goods lines as well as from near Friary Station to Sutton Harbour and to the private lines of the harbour authorities. The branch from Plymstock to Oreston and Turnchapel was also associated with the Plymouth and Dartmoor system, this section having been opened to Turnchapel in July, 1888. The Plymouth and Dartmoor Railway is being incorporated in the Southern Railway as a "subsidiary" company. Other lines in this area were transferred to the London and South Western Railway in 1909, together with the branch from Devonport station to Stonehouse Pool, on the western side of Plymouth, by which access is had to the station and quays brought into use in 1909 in order that the London and South Western Railway could take a share in dealing with American liner traffic. The latter branch also gives access to the private waterside lines at Stonehouse Pool for goods traffic.

As will be seen from the map reproduced, London and South Western trains approach Plymouth from the north, passing under the famous Saltash bridge built by Isambard Kingdom Brunel, near the South Western station of St. Budeaux, and the Great Western halt of the same name. It then continues under Devonport Park in tunnel to reach the London and South Western Devonport station.

From Devonport station connection is made via Devonport Junction and Keyham (Great Western Railway) with the Government lines at the Royal Naval Barracks, Gun Wharf and Dockyards. The traffic from these establishments is often very heavy, and in normal times special trains with seamen, heavy machinery, guns, &c., are frequent, whilst occasional trains with troops are run to and from Devonport, with detachments embarking or disembarking in the dockyard. The dockyards extend for three miles along the water front and cover an area of nearly 300 acres, whilst the Royal Naval Barracks adjoining accommodate over 2,000 men. Drafts from ships in the harbour usually land at the barracks in order to entrain there, small parties being worked specially to Devonport and attached to ordinary trains there.

From Devonport station connection is made with the single-line branch from Stonehouse Pool, and at Devonport Junction the Great Western lines are joined in order to reach North Road station, which is operated as a joint station. London and South Western Railway trains also call at Mutley, there proceeding eastward to Lipson Junction, and curving in a southward direction, still on Great Western property, until at Friary Junction they turn westerly again to reach the Friary terminus. Near the latter, connection is

SOUTHERN RAILWAY MOTOR TRAIN ON VIADUCT OUTSIDE NORTH ROAD STATION, PLYMOUTH.

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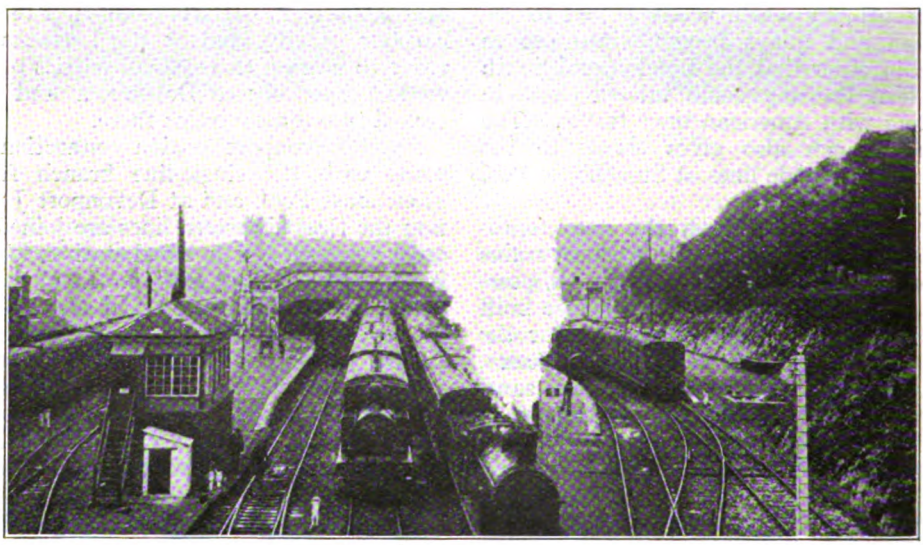
made with the Sutton Harbour lines, while a single-line branch from Cattewater Junction connects again with Great Western lines and with the London and South Western Cattewater Harbour lines. From Cattewater Junction and over Laira Bridge to Plymstock Great Western Railway, trains to Yealmpton travel over London and South Western metals. Plymstock station is owned by the London and South Western Railway, but just beyond the Yealmpton line becomes Great Western property, while the London and South Western branch to Turnchapel proceeds south and west.

Between Devonport and St. Budeaux a service of suburban trains is operated in addition to main-line trains which, except for the expresses, also serve some of the local stations. The local trains consist usually of two third-class bogie carriages and a 0-4-4 tank engine. At busy times, however, it is necessary to strengthen this make-up considerably, and there may be as many as 8 or 10 bogie vehicles requiring the use of two engines, for which reason it is now considered best to work these services by ordinary trains rather than by motor trains as formerly.

Served only by these local trains are several halts. Thus, a short distance north of Devonport station, adjacent to where the Great Western Railway crosses, a halt is provided at Albert Road mainly for the use of dockyard employees, though it is situated between the mouths of two tunnels and is reached by somewhat lengthy stairways. After passing through the second of these tunnels, trains cross the Ford viaduct, and between Ford station and St. Budeaux, Camels' Head Halt, located on an embankment, is provided. With these intermediate facilities, notwithstanding that the Great Western Railway and the local tramways serve the same districts, there is a considerable traffic, while St. Budeaux, opposite Saltash, is a favourite residential district. Several of



LONDON EXPRESS LEAVING FRIARY STATION, PLYMOUTH.

Friary terminus has two main platforms, each with a short bay at its outer end for motor and short trains. The station is passed by Plymouth tram cars and is very convenient for the eastern parts of the town. The goods station is alongside.

Devonport station is an imposing building, and, architecturally, very pleasing. It has ample accommodation for dealing with all classes of Government traffic, which is the principal business done. The station and yard are 600 ft. wide, the platforms are 500 ft. long by 25 ft. wide. There are four end-on loading docks, so that a thousand men can be dealt with on the platforms whilst a train load of horses or guns is being loaded or unloaded simultaneously elsewhere.

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the stations beyond St. Budeaux, though they are served only by main-line trains, have also residential importance, while Tamerton Foliot, Bere Ferrers and Bere Alston (the junction for the Calstock and Callington line) have considerable favour for excursions, picnics, &c., and considerable advantage is taken of the cheap tickets issued daily through the summer months.

East of Friary the London and South Western lines have an equally important, but essentially different traffic, that of the Turnchapel branch. These trains leave the main line a short distance from Friary station, passing Lucas Terrace Halt near the engine sheds but with a platform on the branch only, and proceeding thence over Laira Bridge to Plymstock station. Here Great Western motor trains for Yealmpton which have used the same route from Cattewater Junction diverge, while the London and South Western route continues to Oreston and Turnchapel, both favourite residential districts, while at Turnchapel, within a few minutes' walk of the station, an attractive beach is available. As large numbers of people travel out to Turnchapel for the day at holiday periods and during the summer months, the branch calls for a considerable train service. Ordinarily a motor train is used, consisting of two semi-open cars, on which tickets are issued and collected by the travelling conductor, and worked by 0-4-4 tank engines in place of the small 4-wheeled engines used a few years ago. Usually the engine is not detached, but pushes the two cars in one direction.

This combination is almost continuously employed throughout the day, running between Friary and Turnchapel, 22 journeys in each direction being scheduled in the summer time-tables. At holiday periods, however, and on Saturdays, it is necessary to strengthen the train, and sometimes as many as six vehicles may be required, in which case the engine runs round its train at the termini or a spare engine is provided. Between Oreston and Turnchapel the entrance to a branch of the Cattewater known as Hooe Lake is spanned by a bridge having a swing section. The passenger station at Turnchapel is just beyond this bridge. Tracks are continued for some distance to serve a naval oil depôt and other premises.

EXTERIOR OF FRIARY STATION, PLYMOUTH.

It will, therefore, be seen that the lines referred to not only possess considerable interest but carry an important and in some cases heavy passenger traffic, while on the goods side the London and South Western section of the Southern Railway has its full share of traffic.

Apart from the local services, which are reasonably frequent, stopping trains run

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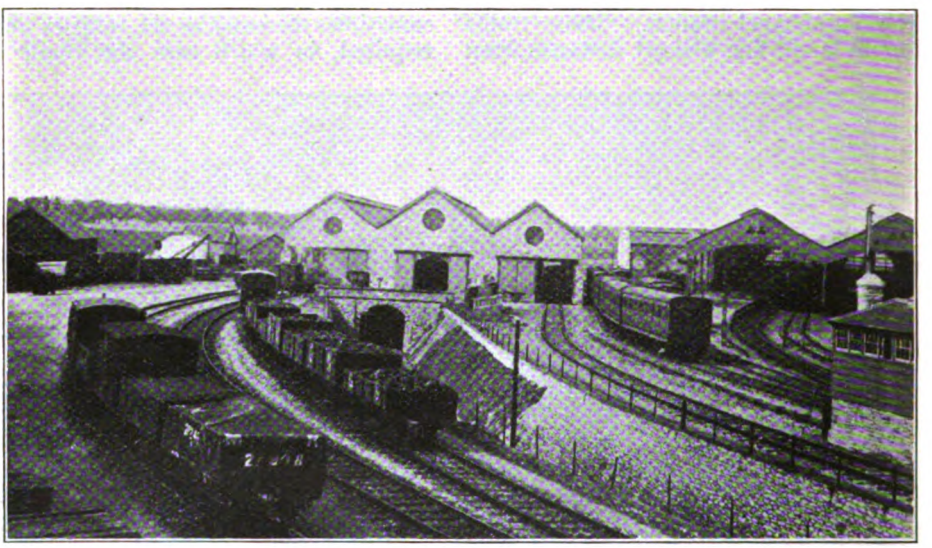
between Okehampton or Tavistock and Friary stations, together with a number of expresses. In the down direction the first of these is a continuation of the 9 a.m. train from Waterloo, leaving Exeter (Queen Street) at 1.5 p.m.; the next is the through luncheon car train from Portsmouth to Plymouth leaving Exeter at 2.3 p.m.; and this is followed at 2.42 p.m. by the train conveying the through coaches from London, attached to the 11 a.m. ex Waterloo. The 1 p.m. from London has a luncheon and tea car attached throughout to Plymouth, and is booked to leave Exeter at 5.21 p.m., while the 3 p.m. from Waterloo, as in the case of the 9 a.m. and 11 a.m. has restaurant car accommodation as far as Exeter. All these trains call only at Tavistock between Okehampton and Devonport.

In the opposite direction the principal trains are the 8.30 and 10.40 a.m., the latter during the height of the season only, 12 noon, 2.12 and 4 p.m. trains for Exeter and London, and the 9.35 a.m. through train for Portsmouth. The 9.35 a.m. and 12 noon have restaurant car accommodation thereon; the others between Exeter and London. On Sundays no local services are operated, but there are three main line trains in each direction, one being a through restaurant car express, 12 noon from Waterloo and 3 p.m. from Friary. All trains serve Mutley, North Road and Devonport stations in going from or to Friary.

The locomotives generally employed are 4-4-0, the principal main-line trains now being worked by superheated engines of the "395" class with 6-ft. coupled wheels, though mixed traffic 4-4-0's and standard 6 ft. 6 in. 4-4-0 locomotives are also to be seen, especially where loads do not exceed six or seven bogie coaches. Goods traffic is worked by 4-4-0 mixed traffic locomotives and 0-6-0 goods engines, while the local and motor trains are generally hauled by Adam's 0-4-4 tank engines. On the dock lines 0-4-0 and 0-6-0 tank engines are to be seen.



GENERAL VIEW OF DEVONPORT GOODS AND PASSENGER STATIONS.

The writer is indebted to officers of the London and South Western section of the Southern Railway and to the station-masters at Friary and Devonport stations, for information and other assistance in the preparation of this article.

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Locomotive and Train Working in the latter part of the 19th Century.

THE BARRY RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

WHEN the Barry Railway first started to run passenger trains in 1889, there was only a shuttle service between Barry and Cogan, a distance of 5 miles. Cogan station adjoins the Penarth Dock station of the Taff Vale Railway, and at that time the Barry had no running powers over the lines of the rival company. Therefore passengers from Barry to Cardiff were obliged to change at Cogan, go over to the Taff Vale station at Penarth Dock, and wait for a Cardiff train. It was not until 1893 that arrangements were made for the Barry Company to exercise running powers between Cogan Junction and Penarth Curve South Junction—1¾ miles—over the Taff Vale, and thence over the Great Western main line to Cardiff.

A limited service of main-line passenger trains was started—I believe in 1890—between Barry and Pontypridd. For these and the Cogan trains there were four 2-4-0 side-tank passenger engines, of which Nos. 21 and 22 were built by Sharp, Stewart and Co. in 1889, followed by 37 and 52 from the same firm in 1890. These had 5 ft. 3 in. coupled wheels, and inside cylinders 17 in. by 24 in., the bearings for all axles being inside. The wheelbase was 15 ft. 3 in., and total heating surface 1,041 sq. ft., of which the firebox contributed 86 sq. ft. The design bore considerable resemblance to the 2-4-0 tank engines built a few years afterwards by the same firm for the Metropolitan Railway (Nos. 71 to 76). For working the shuttle service between Barry and Cogan they were well suited, but for the main line trains it was found necessary to increase the coal capacity, and therefore Mr. J. H. Hosgood, then chief locomotive superintendent of the railway, lengthened the trailing end, and in 1898 converted three of the engines, Nos. 21, 22 and 52 to the 2-4-2 type with radial trailing axle. The wheelbase was lengthened by 6 ft. 6 in. at the trailing end and became 21 ft. 9 in., and the weight in working order after this alteration became 50¾ tons. In 1899, after the appearance of heavier passenger engines, Nos. 37 and 52 were sold to the Port Talbot Railway, but Nos. 21 and 22 remain in service as spare passenger engines and one of them was often used to work the directors' and officials' saloon coaches.

In 1892 a new class of 0-4-4 side tank passenger engine was introduced for the purpose of working the main line trains. The first two engines of this class were Nos. 66 and 67, built by the Vulcan Foundry in 1892, and in 1895, prior to the introduction of a new service of passenger trains between Cardiff and Pontypridd, two more similar engines, Nos. 68 and 69, were delivered by Sharp, Stewart and Co. These four engines have leading and driving wheels coupled, of a diameter of 5 ft. 7 in. and trailing bogie wheels 3 ft. diam. The cylinders are 18 in. by 26 in., total heating surface 1,133 sq. ft. and boiler pressure 150 lb. per sq. in. The engines weigh 56 tons, and the tanks have a capacity of 1,400 gallons of water, the bunkers holding 1½ tons of coal.

By arrangements made with the Taff Vale Railway the main line passenger trains from Barry Island or Barry run beyond Trehafod Junction over the line of the former company to Porth station, a distance of 1 mile 54 chains.

In 1896 a third passenger train service was instituted between Cardiff (Great Western Railway), starting from the docks station at Clarence Road, and Pontypridd. These trains run over the Great Western Railway main line to St. Fagans, from which they diverge over the loop to T.C. Junction, and thence travel over the Barry main line. They are in direct competition with the Taff Vale trains to Pontypridd, the two stations at the latter place being

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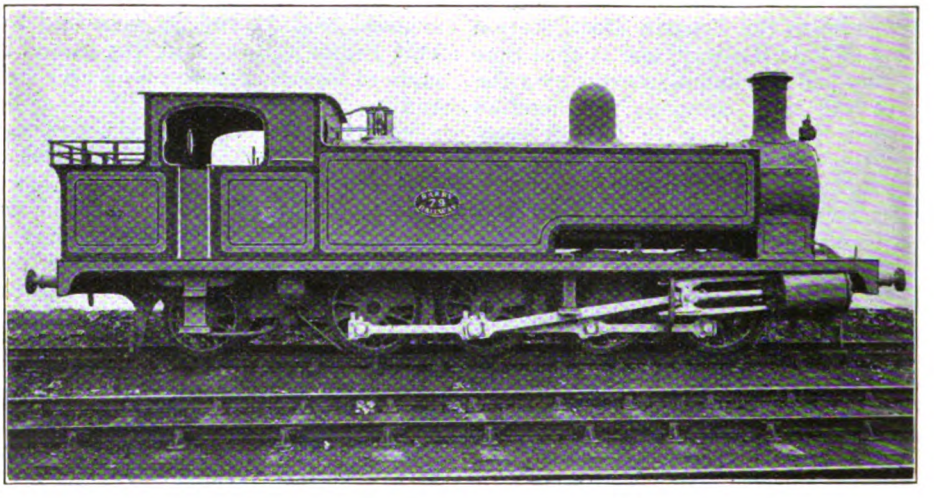
separate. These trains do not go through to Porth, such a proceeding on the part of a competitive service being more than the Taff Vale could stand. Down to this period the Barry railway was confined to the northward main line, and the eastward local trains to Cardiff, with the exception of the short branch to Barry Island to which the trains left the west end of Barry station. But at the end of 1897 the company extended its operations in a westward direction over the Vale of Glamorgan Railway. The Vale of Glamorgan Railway was constructed by an independent company and leased to the Barry Railway. It



0-8-2 MINERAL TANK ENGINE No. 79. SHARP, STEWART & CO., 1897.
Coupled wheels, 4-ft. 3-in. diam. Cylinders, 20-in. by 26-in.

was opened in December, 1897, and follows the coast more or less through Aberthaw to Llantwit Major, thence striking in a north-westerly direction to join the Llynvi and Ogmore section of the Great Western at Coity Junction. A short branch makes a connection with the Great Western South Wales main line at Bridgend. The total distance from Barry station to Coity Junction is 20¼ miles, and the distance over which passenger trains run between Barry and Bridgend is 19 miles. The line is of a heavy undulating character, the gradients in both directions being severe. Travelling from Barry to Bridgend there is a bank of 1 in 81 to 1 in 87 for nearly two miles, and at Gileston a similar bank of 1 in 82 to 83. Through Llantwit Major there is a rise of 1 in 103 to 1 in 121 for 2½ miles. In the opposite direction the principal adverse gradients are 5 miles of 1 in 173 to 1 in 141, and a 3-mile bank of 1 in 198 to 1 in 162. The Vale of Glamorgan Railway provides an outlet to Barry Docks for coal from the Tondu and Maesteg districts of Glamorganshire. The loads of the 0-6-2 standard mineral tank engines over this line were 30 10-ton loaded wagons or about 480 tons to Barry, and in the opposite direction 40 empty wagons weighing about 240 tons.

For working the passenger traffic over the new line, and also to cope with the heavier main line trains to Porth, a new class of passenger tank engine of the 2-4-2 type was designed by Mr. J. H. Hosgood. There are 11 engines of the class, as follows:—Nos. 86 to 88, by Hudswell, Clarke and Co., 1897; 89 to 91, by Sharp, Stewart and Co., 1898; and 94 to 98, by Sharp, Stewart and Co., 1899. The cylinders are 18 in. by 26 in.; diameter of coupled wheels, 5 ft. 7 in; diameter of leading and trailing radial wheels, 3 ft. 6 in.; coupled wheelbase, 8 ft. 6 in.; total wheelbase, 23 ft. 2 in. The tube heating surface is 962 sq. ft., and that of the firebox 106 sq. ft., making a total of 1,068 sq. ft. The tanks hold 1,550 to 1,600 gallons, there being a slight variation between Nos. 86 to 88 and the remainder of the class. The boiler pressure is 150 lb. and the total weight in working

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order about 61 to 61½ tons, of which 38½ to 39 tons are available for adhesion. These were the last passenger engines to be built for the railway.

The colour of the Barry locomotives is dark crimson lake with black bands and fine scarlet lines. The chimney caps were of polished copper, and many of the engines, including the passenger engines, had polished brass dome covers. They are ornamented with the company's coat of arms, which has some points of resemblance to that of the Taff Vale Railway, and like the latter includes a representation of the Welsh dragon enclosed within a somewhat similar scroll. I do not know how many genera and species of Welsh dragons there are, but the Barry variety is a totally different animal from his Taff Vale brother. I made some comments on the appearance of the latter, and as I wish to be perfectly impartial, I may as well describe the Barry species. Unlike the Taff Vale dragon he is not trying to make a riot. Far from it; he is a jovial animal with a very curly tail, and is engaged in doing the "goose-step" with what look very like a clay pipe in his mouth and a grin on his face. The Taff Vale coat of arms is surmounted by the Welsh goat, but in the Barry picture the goat is replaced by a stag's head and antlers. Anyway, the coats of arms of these Welsh railways are certainly striking, and give most of those belonging to English lines points and a beating.

For heavy mineral traffic, seven specially heavy 0-8-2 side tank engines were built in 1897 by Sharp, Stewart and Co. and numbered 79 to 85. Before these were built there had been in this country only five eight-wheels coupled tank engines, all of the 0-8-0 type, but all of them were built in 1864–6 and had been scrapped long before the Barry engines appeared. In introducing the 0-8-2 type, which was quite new in British practice, the Barry again set an example by being first in the field, just as the company was the first to use 0-8-0 tender engines.

The 0-8-2 tank engines were designed for handling long coal trains of 80 to 100 loaded wagons between the storage sidings at Cadoxton and the coal tip roads at the docks, and for this work they have proved very useful. They also now work mineral trains to Pen Rhos Junction, and over the Brecon and Merthyr line in company with the 0-8-0 tender engines, and also to Peterston with exchange traffic to and from the Great Western main line. The cylinders are 20 in. by 26 in., and the eight coupled wheels are 4 ft. 3 in. in diameter, those of the trailing radial wheels being 3 ft. 6 in. diam. The total wheelbase is 22 ft. 11 in. and that of the coupled wheels 15 ft. 5 in. The tube heating surface is 1,361 sq. ft. and that of the firebox 115 sq. ft., making a total of 1,476 sq. ft. Grate area 22¾ sq. ft., and boiler pressure 150 lb. per sq. in. The tanks hold 2,100 gallons of water and the coal bunkers 3½ tons. Weight in working order, 74 tons 16 cwt., of which 62¾ tons are carried on the coupled wheels. Originally they were fitted with flangeless tyres on the second pair of wheels, but when they went into the shops for general repairs it was found that the tyres of the other wheels had worn in such a manner as to cause the wheels to bind between the rails. For a number of years they have been supplied with special tyres with thin flanges for both the second and third pair of wheels.

In 1899 more engines were badly needed, and the Barry Railway found itself in a similar position to that of several of the leading English main lines. The British locomotive builders were so congested with orders that delivery could not be promised for a long time, and consequently orders for ten 0-6-2 tank engines had to be placed abroad. Of these five engines of the Barry standard type were built by the Franco-Belge Company and have already been mentioned. The order for the other five engines was placed with an American firm, the Cooke Locomotive Company, of Paterson, New Jersey. These engines, Nos. 118 to 122, were a combination of British and American practice. The 4 ft. 3 in. coupled wheels, 3 ft. 6 in. radial wheels, wheelbase, boiler, boiler fittings, cab, side tanks and coal bunker conformed to the Barry standard designs. The drum-head smokebox was supported on the usual American saddle casting between the cylinders. The cylinders, 18 in. by 24 in., were outside with the steam chests on the tops, and the balanced valves, of the Trick type, were operated by the usual long valve spindle and rocking shaft of American type. American bar frames are used,

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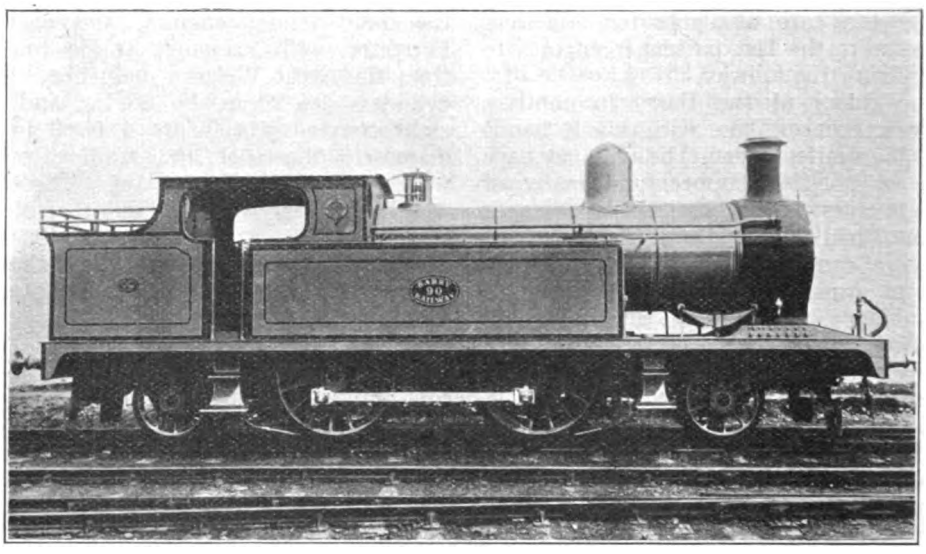

Photo.] **2-4-2 PASSENGER TANK ENGINE No. 90.** [*Loco. Publishing Co.*

Coupled wheels, 5-ft. 7-in. diam. Cylinders, 18-in. by 26-in.

which extend from the front buffer beam to a point behind the third coupled axle, where they are bolted to a plate frame extending to the trailing end, and in this extension the guides for the radial axle-boxes are made. Brass tubes and copper fireboxes were supplied in accordance with British practice, and the engines were fitted with Davies & Metcalfe's exhaust steam injectors. It will be noticed that the stroke is only 24 in. instead of the 26-in. standard of the Barry 0-6-2 engines, but compensation is obtained by using 160 lb. pressure instead of 150 lb. The tube heating surface was 1,049 sq. ft., and that of the firebox 98 sq. ft., total 1,147 sq. ft. Total weight in working order about 56¼ tons. Tests made of the coal consumption of these engines showed that they burnt just about the same amount per ton-mile as the standard Barry 0-6-2 tank engines.

The above account brings the story of the Barry Railway down to the end of the 19th century, but it may not be out of place to mention two important extensions of the railway which were made during the first five years of the present century in order to tap the coal traffic of the district north-east of Cardiff for the benefit of Barry docks.

Having discovered T.C., that spot with an exuberance of vowels, it was decided that another junction there would do it no harm, and a line, opened in 1901, was made from T.C. in a north-easterly direction, which crossed the Taff Vale near Walnut Tree Junction and effected junctions with the Rhymney Railway near Caerphilly at Pen Rhos and Eneu'r'glyn. The latter is another fine example of a junction with an excess of name; it was too much for the signalling department, who switched a "u" and the brace of apostrophes out of circuit, and with commendable wisdom cut it down to Energlyn. The gradients on this section are severe; shortly after leaving T.C there is a 1 mile rise of 1 in 108 followed by 1½ miles of 1 in 80, and a little further on there is another 2-mile bank of 1 in 80. A short extension from Energlyn North Junction, made subsequently, brought the Barry Railway to the Brecon and Merthyr Railway, and from this point, known as Barry Junction, running powers are exercised for mineral traffic to Rhymney (Brecon and Merthyr Railway), a distance of nearly 11½ miles. As mentioned previously, the 0-8-0 tender engines are now working this line.

The guide book says that "the history

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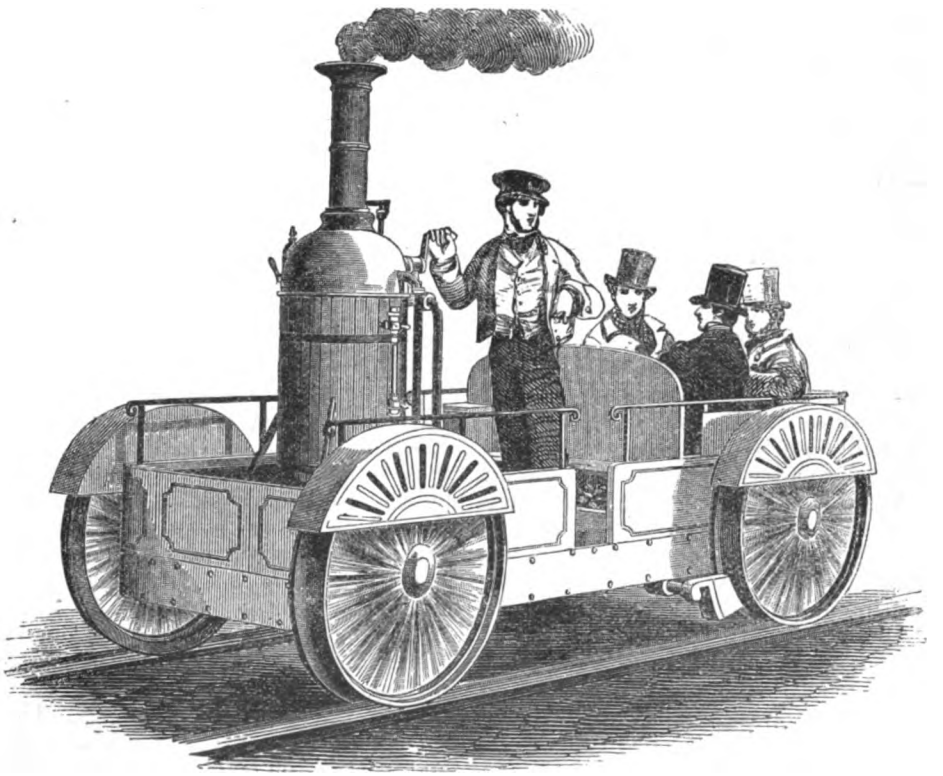
of the Barry Railway forms one of the most romantic chapters in the story of the industrial development of South Wales." "Romantic" is rather a good adjective; it reminds me of King Arthur's knights, who prowled round that district from the neighbouring town of Caerleon. I have tried to connect it with the far-seeing keen business-headed coalowners of the Rhondda district, and I have imagined the latter with sword, shield, and spear wandering round Barry Island in search of treasure. And since they found it, perhaps the guide book is right.

In conclusion, I wish to express my indebtedness to Mr. W. Waddell, M.Inst. C.E., late General Manager and Chief Engineer, and to Mr. J. Auld, M.I.Mech.E. the Chief Locomotive Engineer of the line, who have kindly supplied me with information concerning the working of the Barry Railway. The article was written before the recent absorption of this and other Welsh railways into the Great Western system.

RAILROADING IN THE EASTERN COUNTIES IN 1847.



From an old Woodcut.

(For particulars see "Pertinent Paragraphs.")

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The Cricklewood-Acton Branch of the Midland (L.M. & S.) Railway.

By G. D. MILLAR, M.A.

THE history of the Midland Railway in the London district, though on a scale less extensive than that of most of the other great railways which terminate in London, is nevertheless not without interest, and one of its most notable features is the chequered career of the Cricklewood-Acton branch.

The enterprise was started as an independent company entitled the Midland and South Western Junction Railway Company*, which was incorporated as early as 1864 with the object of constructing a railway " from Acton Wells to the Midland Railway at Child's Hill " (the original name of Cricklewood station). On the completion of the line the Midland Railway undertook to work it, and in 1874 the original company was vested in the Midland Railway. The object of the line was, as its name indicated, to provide a connection between the London and South Western Railway and the Midland Railway extension to London, which at that time existed only in embryo. By means of this connection a through route would be provided between the midlands and north of England and the southern counties, a route which would avoid passing through congested lines in the heart of London by skirting through the comparatively empty stretch of country between Cricklewood and Willesden. At the same time there was the further thought that a profitable local traffic could be built up through the building development of the Neasden, Willesden and Harlesden districts. At that time, of course, the Baker Street extension of the Metropolitan Railway was not open, and no line at all existed in the area between the London and North Western and the Great Northern Railways. That this part of the scheme did not prove a success was not due to lack of enterprise on the part of the Midland Railway, but rather to subsequent railway developments which could not be foreseen when the branch was built. The part of the scheme relating to goods traffic has always justified the construction of the line, which is now used as a short and convenient cross-country route, principally for coal trains from northern collieries to the southern counties.

The line was not completed for some years after the formation of the company, and first appears on the Midland Railway time-table maps in the issue of October 1, 1873. It is shown there, moreover, purely as a link line, without stations, though the latter were completed in the course of the next two years. When the railway was opened to passenger traffic, Cricklewood station was a small two-platformed structure, the down platform having nothing for superstructure but a small open shelter. This latter, indeed, is the only accommodation on this platform even now, but since the enlargement of the station when the second pair of lines were laid, the majority of the trains use the local lines, not more than two or three stopping trains a day using the main-line platforms. The original waiting-room on the up platform also still exists as an " extra," the back wall (with a door let into it) facing the local lines. In those days the station was used principally by the residents of Child's Hill, as Golders Green was, of course, open country, and Cricklewood was nothing more than a small cluster of ancient houses on the Edgware Road.

The Acton branch leaves the main line immediately to the north of Cricklewood station, and bends sharply to the left through the loaded-goods sidings. Thence it at once crosses over the Edgware Road, and, running on embankment, is met by a spur which leaves the goods line (formerly it left the main line) and, running under the Edgware Road, rises up a steepish incline to join the other curve from Cricklewood station. The line then proceeds

* Not to be confused with the other company of the same name, which, of course, did not come into existence until much later.

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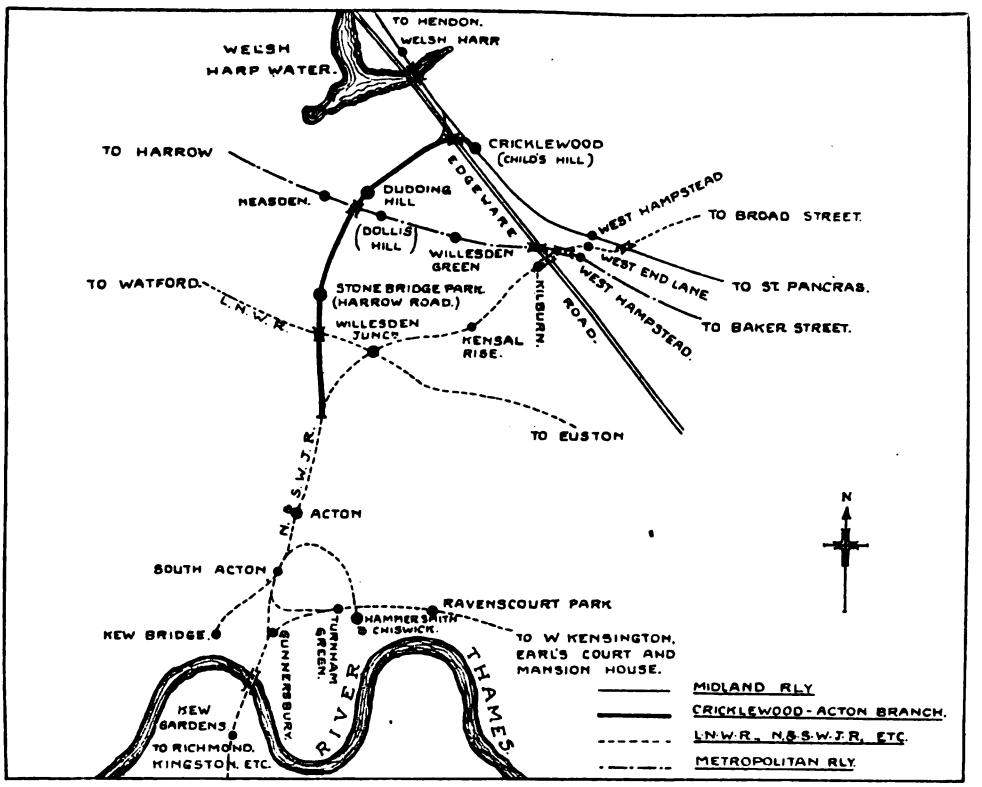
first south-west and then due south, and runs into cutting at Dudding Hill. Here was the first station (now used as a local coal depôt), a red brick construction with flint platforms edged with brick, situated some five minutes' walk from the Dollis Hill station of the Metropolitan Railway.

Passing under the road at Dudding Hill, the line again emerges on embankment, and crosses over the Metropolitan extension a few yards on the London side of Neasden Junction, crosses over the main road to Acton, a few hundred yards from Willesden Junction station, by a small steel underbridge with unusually low parapets, and joins the North London Railway (or, to be exact, the North and South-West Junction Railway) at Acton Wells. A connection is thus formed both with the London and North Western Railway and also with the London and South Western Railway to Kew, Richmond, Twickenham and the South Western system in general. The



CRICKLEWOOD-ACTON BRANCH, MIDLAND (NOW L.M. & S.) RAILWAY AND CONNECTIONS.

station. Thence it proceeds almost due south, and running downhill into cutting, crosses under the Harrow Road, where the second station, Stonebridge Park (originally Harrow Road, but altered during the 'eighties) is situated. This station, now used as a coal depôt, is also a red brick structure with two platforms, somewhat smaller than Dudding Hill. On leaving Stonebridge Park the railway runs alongside the London and North Western Railway sidings and sheds north of Willesden actual junction between the Midland and North and South Western Junction systems is situated on the north side of the Acton road, there being a London and North Western Railway signal at the northern end of the under-bridge and a Midland one some hundred yards further north.

The opening of the line was announced in the Midland Railway timetable for July, 1875, as follows :—

Alterations of Trains.—New route between

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Moorgate Street and Richmond. The Cricklewood and Acton branch (which connects the Midland with the London and South Western Railway) will be opened on August 3 [1875], and on and after that date a service of Midland trains will be run between Moorgate Street and Richmond. The trains between Child's Hill and Richmond will not commence running until Tuesday, August 3.

The times of starting and arriving trains were as follows :—

	a. m.	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.	p. m.	p. m.	p. m.	p. m.
Moorgate Street ..	—	8 46	9 37	—	12 10	—	4 1	5 15	6 14	7 5	—
Kentish Town ..	7 45			—		—					—
Child's Hill and Cricklewood.				11 18		2 35					9 17
Richmond (New Station).	8 25	9 38	10 27	11 53	1 6	3 5	4 56	6 5	7 9	8 0	9 53

SUNDAY TRAINS.

	a. m.	a. m.	a. m.	p. m.	p. m.	p. m.
Moorgate Street..	7 34	—	—	—	—	—
St. Pancras		8 30	—	—	—	—
Child's Hill and Cricklewood			10 3	1 38	4 18	5 4
Richmond (New Station)	8 29	9 17	10 33	2 17	4 52	6 17

Departure and arrival stations only are shown, as all the trains stopped at every intermediate station. It will be seen that through trains ran both from Moorgate Street and Kentish Town to Richmond, and, even on Sundays, one from St. Pancras.

This service, however, did not prove a success; it was withdrawn on February 1 of the following year, and a shuttle service between Child's Hill and Harrow Road was substituted for it. The Midland Railway time-table for May, 1877, shows trains leaving Harrow Road at 7.58, 8.54, 10.14, 10.58 and 11.7 a.m., and 3.24, 4.31, 5.59, 7.38 and 9.5 p.m., reaching Dudding Hill four minutes and Child's Hill nine min. later. In the reverse direction, trains left Child's Hill at 8.20, 9.35, 10.30 and 11.36 a.m. and 2.37, 4.8, 5.33, 6.27 and 8.2 p.m., reaching Dudding Hill five min. and Harrow Road nine min. later. There were no Sunday trains. In all cases convenient connections were arranged at Child's Hill with trains both from St. Pancras and Moorgate and with the London, Chatham and Dover through service to Victoria, and, in the other direction, with trains from Hendon and the Welsh Harp stations*.

* Now abolished, the sole vestiges being the sloping passage down to the former entrance, and the name on the adjacent signal cabin : " Welsh Harp Junction."

On May 1, 1878, the service was extended to Turnham Green, with District connections to Richmond, Earl's Court and the Inner Circle. The first train left Dudding Hill at 7.6 a.m., Harrow Road 7.10, Acton 7.16, and reached Turnham Green at 7.21, where it met a connection at 7.21 which arrived at Richmond at 7.36. The first train in the opposite direction connected with the 7.43 a.m. from Richmond, and left Turnham Green at 8.5, Acton 8.10, and Harrow Road 8.16, reaching Dudding Hill at 8.19. There were fifteen trains daily in each direction (no Sunday trains), the last leaving Dudding Hill at 10.13 p.m. and Turnham Green at 11.26 p.m. This service, however, failed to attract the expected traffic, and was withdrawn on September 30, 1880. From that date the shuttle service between Child's Hill and Harrow Road was resumed, the Midland Railway time-table for July, 1883, for example, showing the following trains :—Child's Hill, depart 7.20, 7.55, 8.35, 9.14, 9.58 and 11.48 a.m., and 12.40, 1.53, 4.8, 5.31, 6.9 and 6.57 p.m., arriving at Dudding Hill 5 min. and Harrow Road 9 min. later; and in the reverse direction : Harrow Road depart 7.41, 8.20, 8.56, 9.38 and 11 a.m., and 12.9, 1.8, 3.20, 4.29, 5.51, 6.32 and 7.31 p.m., arriving at Dudding Hill 4 and Child's Hill 9 min. later. The 9.14 and 9.58 trains connected with through London, Chatham and Dover trains from Victoria to Hendon. There were again no Sunday trains, as, of course, there would be no " holiday outing " traffic.

This service continued with but little variation until July 2, 1888, when the line was closed to passenger traffic. The Metropolitan Railway, whose Baker Street extension had been opened in 1868, and which had extended by degress to Harrow

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and beyond, proved a formidable competitor for the Willesden - Harlesden - West Cricklewood traffic, as its route was much more direct than the Midland's, and did not involve a change such as that at Child's Hill (Cricklewood); the Metropolitan station at Dollis Hill, was, of course, not constructed until years later.

However, the Midland were not beaten yet, and on January 1, 1893, reopened the branch and resumed the service from Child's Hill to Harrow Road, the name of which was changed to Stonebridge Park. Apparently this did not prove promising, for on January 1, 1894, the service was extended to Gunnersbury, and an elaborate series of connections was established, with the North and South-West Junction Railway at South Acton for the Hammersmith and Chiswick Branch and Kew Bridge; with the London and South Western Railway at Gunnersbury for Twickenham (via Hounslow), and at Richmond for Kingston, Sunbury, &c.; and with the District Railway, via Turnham Green, Hammersmith, &c., to the Inner Circle (Mansion House). The usual connections were, of course, arranged at Cricklewood with St. Pancras and Moorgate and with Hendon and stations north thereof. The first train left Cricklewood at 7.20 a.m., Dudding Hill 7.25, Stonebridge Park 7.29 and arrived at Acton 7.35, South Acton 7.37, and Gunnersbury 7.40. There was an average hourly service (12 trains down and 13 up) except in the middle of the day, when little traffic could be expected. The last train at night arrived at Cricklewood at 11 p.m., where it connected at 11.17 with a train from Bedford to St. Pancras.

This service continued with various minor alterations for some years, but apparently the competition of other railways and of road traffic proved too severe. On October 1, 1904, passenger services were finally withdrawn from the Cricklewood branch of the Midland Railway, and the line was once again given over entirely to goods traffic. It is interesting to note, however, that this line is used by the Royal family when travelling from Windsor to the north; but its stations, Dudding Hill and Stonebridge Park, must now be numbered among that company of " dead " stations to which the war has made such formidable additions.

In conclusion, I should like to express my thanks to officers of the late Midland Railway Company for information very kindly placed at my disposal.

DOWN OXFORD EXPRESS, GREAT WESTERN RAILWAY.

Photo. WORKED BY 4-4-0 LOCOMOTIVE No. 3276, " SAINT AGNES." [*F. E. Mackay.*

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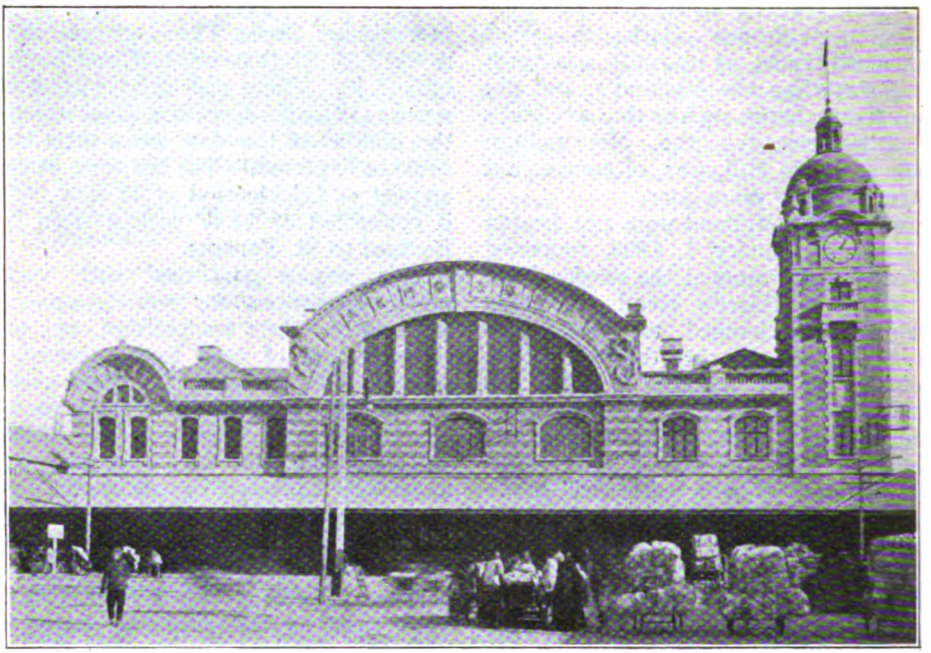

PEKING STATION.

Chinese Railways.

By H. STRINGER, Resident Engineer, Tongshan, Peking—Mukden Railway.

CHINESE railways are best classified as follows :—

1. Those under the Board of Communications, a department of the Chinese Government, in control of Railways, Roads and Telegraphs.
2. Concession lines, which are independent railways built with foreign capital, and under foreign management.
3. Private lines, the result of unassisted and uncontrolled native effort, or mineral railways.

These are in order of importance as regards mileage, and will be discussed as regards history, finance and standards of construction in the order indicated above.

Though Chinese railway history began with the construction of the 10-mile narrow-gauge railway from Woosung to Shanghai, it was not until 1881 that railways in China received any official sanction. Until that date China refused to recognise the necessity for marching with the times, and preferred to believe in the maintenance of her former isolation and self-sufficiency. It was due to the influence of Li Hung Chang that this policy was unwillingly reversed, though he, too, would have preferred to maintain the old order of things. Reactionary official of the old type, he was by birth, education and self-interest opposed to innovation, and from 1863* onwards placed every obstacle in the way of industrial expansion. Fear of Japanese aggression induced him to change his policy in 1878.

The methods he adopted to induce its acceptance at Court enhanced his already great reputation as a Machiavellian diplomatist. " Machiavellian " is, perhaps, no

* The date of Sir Claud Macdonald Stephenson's first proposals for a railway system in China.

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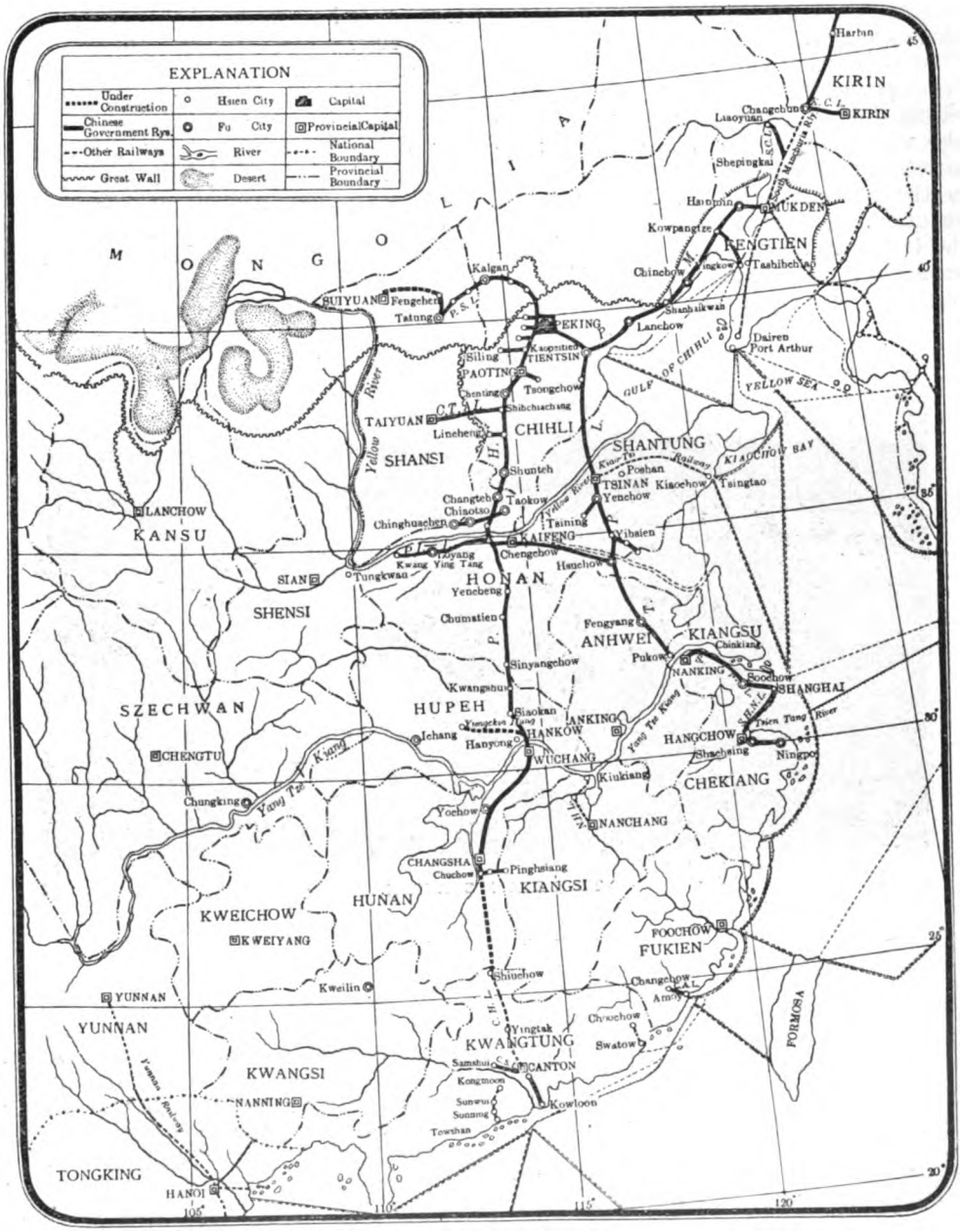

GENERAL MAP OF CHINESE GOVERNMENT RAILWAYS.

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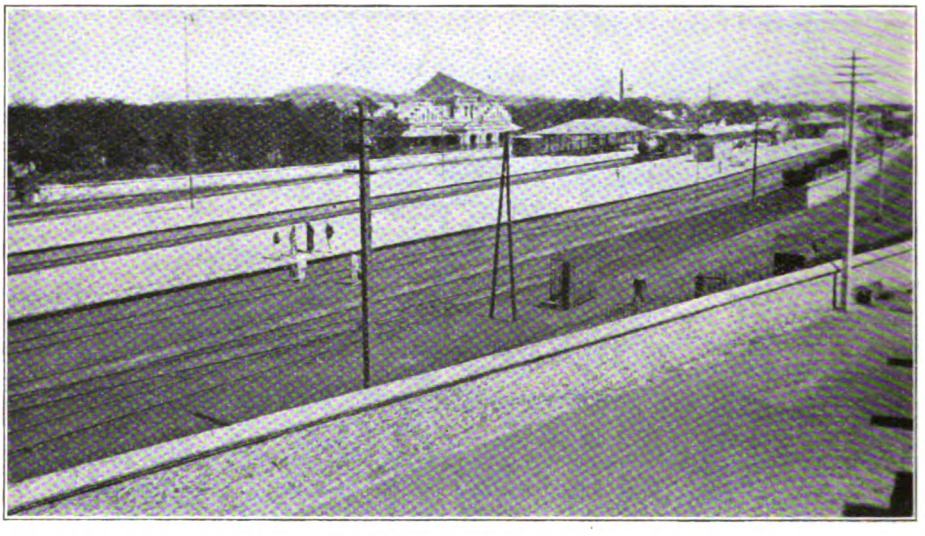
compliment to Li, for in tortuous negotiation he had few worthy imitators and no peers.

Chinese railway policy has undergone various changes dictated by strategic, financial and domestic considerations. Thus railways originated in 1881 with the development of the Tangshan coal field in North China. An independent coal supply was required for the Chinese mercantile marine and infant navy, both then in the making under Li Hung Chang's direction. The railway thus created by the transport needs of the mines was extended into Manchuria, with the idea of improving the military situation there, and this aim was pursued with increased stubbornness after the disaster of the Japanese War of 1894. Then, as a reward for assistance by Russia, Germany and France in the matter of the revision of the Shimonoseki Treaty, which terminated the Japanese War, China was for a short time driven to granting railway concessions. This was followed by official nightmares caused by the supposed disruptive tendency of the railway concession, and the policy of railway construction under Government control, but with foreign capital, was initiated, to persist in some sort ever since. Even this policy was for a short time almost abandoned between the years 1906 and 1910 as the result of the rise to power of the native "China for the Chinese faction," who agitated for full control of foreign loans and independence even of Peking's mild rule. Foolishly, they were allowed to experiment, with resulting enormous extravagance, diplomatic difficulty, and bad blood over the allocation of blame for derelict schemes. The outcome of these troubles was the famous edict of 1911 reserving trunk line construction to the Central Government, a decree which precipitated the Revolution of 1911, but whose wisdom was recognised subsequently by the Republican Government.



TONGSHAN STATION.

The centre of a mining district producing 4,000,000 tons of coal annually. It was here that the first railway in China was made.

These foreign railway loans have carried with them in all cases a varying degree of constructional and financial control on the part of the nation supplying the money. This control, which was amply provided for in the first British loan agreement for the extension of the Peking–Mukden Railway in 1898, has gradually been relaxed until at the present time what are known as "Pukou terms" have become standard for railway loan agreements. The outstanding feature of these later loan agreements is the subordination of the foreign engineer-in-chief to the Chinese Director of the railway, and the placing of financial control in his hands.

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Germany initiated these terms of doubtful wisdom.

With the above exception, the only change in the tenour of recent loan agreements has been a reduction in the premium to be paid on bonds, if redemption is sought before the specified period, which varies from 10 to 50 years. In the case of the Peking–Mukden Railway loan, this premium was fixed at 20 per cent. over par value, but this has been reduced in every later loan agreement to 2½ per cent.

All loan agreements have a clause forbidding amortisation of the loan before the lapse of a period varying from 10 to 12 years. In addition, with the exception of the Peking–Mukden loan agreement, a commission of 5 per cent. or an agreed lump sum is paid to the loan syndicate on all purchases for covering inspection and other charges. This purchasing clause also has been a bone of bitter contention between China and her foreign financiers, and the struggle has resulted in China being legally entitled to purchase materials by tender in the open market. The majority of the loans bear interest at 5 per cent. and are on a gold basis.

As regards the present financial condition of the Government system according to the 1919 report (the last available), the return on capital invested amounted to just over 7 per cent., while if the foreign capital invested in the Government railways is excluded the return on the Government investment amounted to some 16 per cent. The capital invested in railways is valued at 511½ million dollars, of which more than half has been raised abroad.

Owing to the loan agreement system, which necessitates employment of officials of the nation supplying the capital, the management of the Government railway is split up into 16 systems, all united under Government control, but mutually independent. There is, however, a clearing house for through bookings, and regulations have been compiled for interchange of rolling-stock, which is, however, a matter of some difficulty owing to the many standards in use.

TIENTSIN EAST STATION.

The total length of the Government railway system is 3,750 miles, or 6,027 kilometres, while 294 miles are under construction.

As regards standards of construction. The gauge of the Government lines is 4 ft. 8½ in., with the exception of one line of 150 miles, which is metre gauge—a most regrettable mistake in view of the future importance of the line. Two of the concession lines are also of different gauges, so that China is faced to a limited extent with the gauge question in the future.

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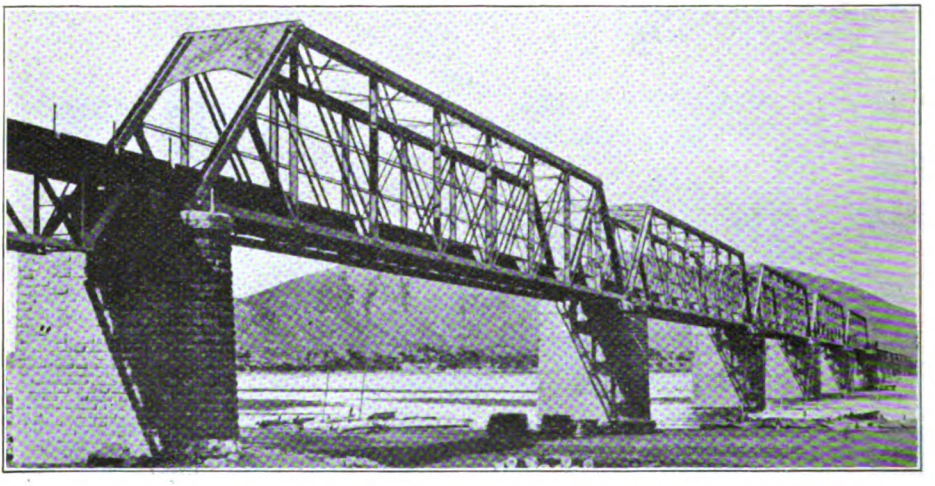
The standard railweight is 85 lb., on which axle loads for engines do not so far exceed 18 tons. Gradient and curvature limits are 1 in 150 and 1,000 ft., except in mountainous districts. Standards of construction and maintenance are high, and speeds up to 60 miles an hour are permissible. The total cost of the road and equipment up to date averaged 120,000 dollars* per mile, and the cost of operation some 10,000 dollars per mile. The employees number over 73,000, excluding those on construction work.

As regards rolling-stock, there were in use at the end of 1919, 551 locomotives, 1,323 passenger vehicles and 11,273 goods wagons, of which last there is a very great shortage for the traffic offering.

Locomotive performance is remarkably high, the average annual performance amounting to over 35,000 miles per annum. Shunting and standing in steam are, however, reckoned on a fixed mileage basis. The prevailing design of locomotive is six-coupled, with a leading bogie, superheated, with steel fire box. The Westinghouse brake is universally used, as is also the automatic central Janney coupler. The average consumption of coal per train-mile amounted to about 96 lb., and the average age of the locomotives was 11 years. The policy in view of present high costs is to prolong the life of the machine as long as possible.

Passenger vehicles are of the corridor type, with a seating capacity of 33 first class and 78 third, where the prevailing type is without partitions. Carriages are steam heated and fitted with Westinghouse brake. Sleeping and restaurant cars are run where required. Goods wagons are of high capacity, 23 tons being the average. As a rule, they are only fitted with a hand brake, the covered wagon excepted. The average train load amounted to 270 tons in 1919, and the stock was utilised 77 times in conveying a total tonnage of over 21 millions. The average haul was 112 miles.



LAN CHOU BRIDGE.

Engine drivers are, without exception, Chinese, foreign inspection being confined to the sheds and shops. Most of the various railways have their own shops for repair work and building, but new work of any magnitude is only undertaken by the shops of the Peking–Mukden Railway. The work turned out by Chinese workmen, if properly supervised, is well up to European standards.

Turning to the concession lines, these are four in number, with a total mileage of 2,350. The details are as below.

The *Chinese Eastern Railway* has a length of 1,080 miles, and is of 5-ft. gauge, with a rail weight of 65 lb. The concession was granted to the Russians in

* The Chinese dollar at present exchange is about 7 to the pound sterling.

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1895. Since the break up of Russia the railway has suffered from numerous changes of control, and is now under the management of a Russo-Chinese Board.

The *South Manchuria Railway* is under Japanese control, and has a mileage with the Antung Mukden Railway of 720. The rail weight is from 80 to 60 lb., and the line is excellently and adequately maintained and equipped. The concession was obtained by the Russians in 1898, and was ceded by that country to Japan as the result of the Russian defeat in the war of 1904. The gauge of the railway is 4 ft. 8½ in., and it has a junction at Changchun with the Chinese Eastern and at Mukden with the Government Railways.

The *Shantung Railway* is under Japanese control, and has a mileage of 269. The rail weight is 60 lb. on steel sleepers, an innovation due to the previous German management. The concession was obtained by Germany in 1898, and ceded to Japan as the result of the Peace Conference award of 1919.

The *Yunnan Railway* is under French management, and has a mileage of 290. The gauge is metre, and the rail weight 50 lb. on steel sleepers. The concession was obtained in 1898. The line was extremely costly, both in lives and money, and is still a charge on French Colonial revenues.

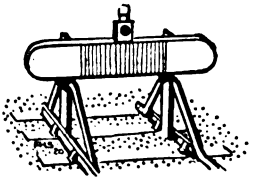
All these concession lines carry with them exclusive exploitation rights as regard mineral, industrial and other development within a certain zone; and in the case of the first three police rights were also conceded. The right of purchase is in every case reserved by China.

Of the private lines all that need be said is that they number eleven, with a total mileage of 483. The gauge, with one minor exception, is 4 ft. 8½ in. The bulk of the mileage is comprised in three derelict native concerns dating from the outbreak of native railway fever in 1906. The remainder are mineral lines constructed to second-class but fairly efficient standards.

Summarising railway mileage in China, it will be found that this totals 6,800 or 2,768 miles of territory and 54,000 people to each mile of line. India, a country of similar needs and population, has 40 square miles and 8,600 people to each mile of line.

Great Britain's share in Chinese railway development has been disappointing. As in the Pacific and Siam, we were the pioneers of progress in China, opening up the first mine in 1878 and building the first railway in 1881, but as in the case of the two foregoing countries, we lost the position which our experience should have given us when these countries attracted the attention of our competitors. Briefly, we have constructed and still manage to a limited extent about 1,400 miles of the Government system, in which we have invested capital to the extent of £13,000,000; we also hold concessions for lines under construction or proposed amounting to over 2,000 miles.

Railway construction in China was, of course, interrupted by the war, and is still in abeyance. The need for resumption is more than pressing.



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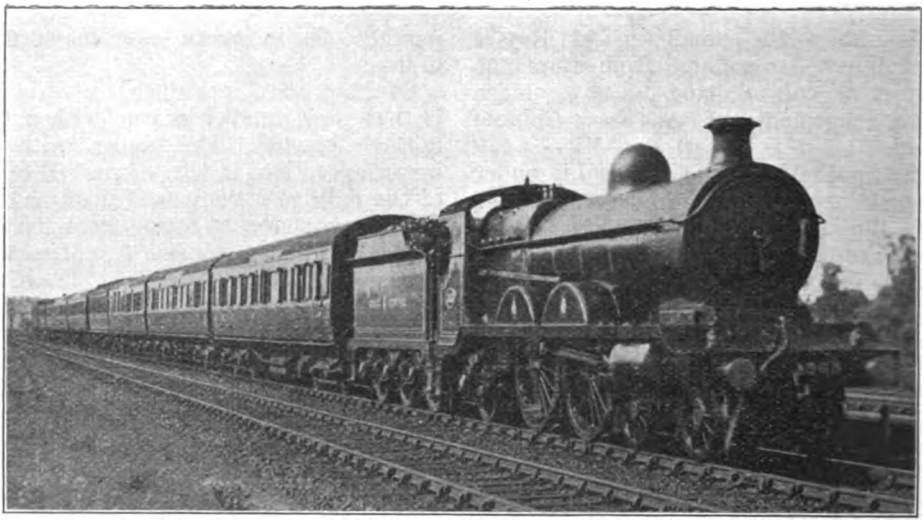

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*F. E. Mackay.*

Bradford-London Restaurant Car Express.
Great Central Three-Cylinder Compound 4–4–2 engine, No. 363.

Dining and Restaurant Cars on British Railways.

By E. G. MARSDEN.

THE first introduction of travelling restaurants on British railways may be traced to the use once made by the Midland Company of the American Pullman car. These vehicles had luxurious drawing-room and sleeping accommodation, but they were only able to serve the lightest of light refreshments. However, they were responsible (more or less directly), for the building and putting into service in 1879, of the first real dining saloon to be run on the railways of this country. This was on the London–Leeds service of the Great Northern Railway, between which company and the Midland there was keen rivalry. This being so, it is not surprising to find that such coaches were also running on the competitive services of the Midland Company between the same centres before three years had elapsed. From this time onwards the use of the dining car spread, and to-day in all long-distance trains they are considered an essential by the travelling public. Yet in its infancy the restaurant carriage was not used upon the longest distance trains of this country, such as the Scotch and Cornish expresses of the companies concerned, but on the "half-way" trains such as the London–Leeds–Manchester–York, &c., expresses. Though at first this seems strange, there was a reason for it. This was in the large amounts of money expended by the respective companies in providing palatial dining rooms *en route*, at Preston, Normanton, and York, respectively, on the three lines to the north, and at Swindon on the southern route of the Great Western Railway, who had in 1842 entered into an agreement with the Swindon Junction Hotel Company to stop all important trains there for a lunch interval of 10 min. The hotel company had to be bought out 53 years later, by a re-fund of their original capital, viz., £100,000, the agreement having been for 99 years. Fortunately, all this is a thing of the past, and there are now running in these islands, over 300 trains possessing restaurant facilities.

There are several types of dining and kitchen cars, each designed with a view to some particular or peculiar working. There is the "set" consisting of first and

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third-class dining saloons separated from each other by a kitchen carriage. One may see a set like this on the East Coast Scotch trains, and the five-coach, six-bogie set recently built at Doncaster for the Leeds–London service of the Great Northern line is provided with a separate and complete kitchen car. A modification of this is the more common two-coach set, where the kitchen is part of one of the coaches. The Scotch services of the Midland route furnish a very good example of this. Here there is a large first-class coach, carried on two six-wheeled bogies, with the kitchen, and connected at that end with a third-class saloon, carried on two four-wheeled bogies. In certain sets the kitchen is part of the third-class coach, and part of another coach is occupied by the first-class saloon, as on certain North British trains, this type being used where there are fewer people to be served, or a longer time to serve them in. Still another modification of the first example is the one-coach complete dining saloon, with first and third-class compartments, separated by a kitchen in the centre of the car. This is a very common type, and it is a very handy class of vehicle too, as the accommodation can always be enlarged by adding other saloons to either end if required. The restaurant car of the Great Western "Cornish Riviera" express is after this pattern, and examples may be found running on most railways. Another popular system of working is that of having but one car on the train, so furnished that it may be used as a first-class car if necessary, and using this car to seat all comers who wish to satisfy their hunger. If this one car be found too small, tables are often fitted up in the compartments, after the style adopted in certain tea-car trains on the London and South Western Bournemouth route. Such cars as those last described are in very general use in this country, especially on cross-country services such as Swansea–Newcastle, Derby–Bristol, Banbury–York, &c. This is an excellent system and the ideal for the services mentioned and kindred ones, but it may be argued, and not without reason, that some difference should be maintained between passengers of different classes.

The position of the restaurant cars in a train is a very important matter, although it scarcely receives at times the consideration due to it, as this has a great bearing on the success or failure of the working of the caf. It is an essential that the gangways of the units comprising the "set" should be kept as clear as it is possible to keep them, so that the train staff shall not be hindered in their progress along. It

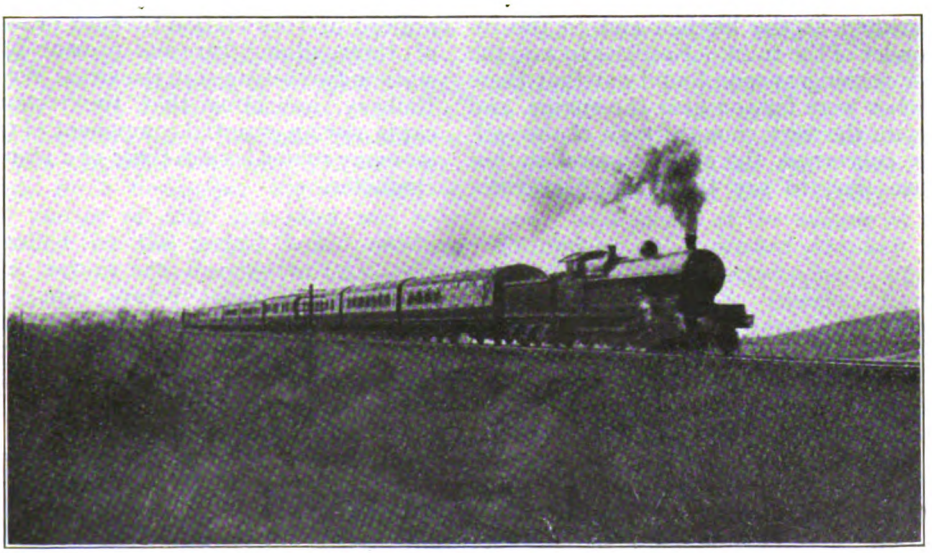

Photo.] **LONDON MIDLAND & SCOTTISH RAILWAY.** [*O. S. Nock.*

Liverpool–Glasgow Restaurant Car express on Grayrigg bank. London & North Western four-cylinder 4-6-0 locomotive, No. 2101, "Claughton" class.

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is very distracting for the passengers seated in these open saloons to have other passengers passing up and down; that is to say, the use of the restaurant set as a corridor should be at a minimum, and third-class passengers should not have to pass through the first-class car on their way to and from their own *salle à manger*. The position of the kitchen should also be carefully considered. It should be placed where the food will have to be carried the shortest distance, that is in the most central position.

We have seen how in practically all types of dining car sets the kitchen occupies the space between the two saloons, and the plan adopted by many companies in regard to placing the entire set is to divide the train into two portions, one first class, the other third class, and to place the set between them. An excellent example of this is found in the five-coach, six-bogie set mentioned above, and most Great Northern expresses are arranged on this plan. Although this "perfection" is not always realised, it is only just to say that on the whole British railways consider these points carefully, and the result is an efficient service, such as we see to-day.

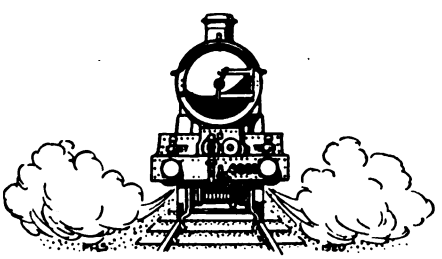
Travelling recently on a certain route, the author noticed that the vehicle next to the locomotive was the third-class dining saloon, then came the first-class saloon, connected at the kitchen end to the remainder of the train. Needless to say, the poor passengers soon found out that these coaches were far too near the engine, and despite the very smooth track of the railway concerned, the effort to swallow hot coffee was, to say the least, disastrous. Fortunately an arrangement like this is the exception rather than the rule. Compare the present-day system of dining *en route* with the following, extracted from a letter published in 1844 :—

"I stopped for breakfast at Derby, obtained a cup of tea, succeeded in getting two very small pieces of dried toast, asked for more, was told it was making, and after waiting for about a quarter of an hour, was obliged to leave the table, having consumed one cup of tea and two pieces of toast about an inch wide and four inches long, for which I paid 2s. 6d. . . . I was afterwards told the waiter had cheated me, and that he ought only to have charged 2s."

But even this was a great advance on the system in vogue seven years previously, when we read in the time-table of the Grand Junction Railway that :—

"No person will be allowed to sell eatables of any kind on the line. The company earnestly hope that the public will co-operate with them in enforcing this regulation, as it will be the means of removing a cause of delay."

What a change has taken place, and what room there was for it to take place. The way in which our railways work their travelling refreshment and dining saloons to-day should command admiration and appreciation from all. Recently the author noticed in York station that out of a total of three dining car sets present in the station, two belonged to the Great Western Railway, indicating that the restaurant car is now an essential component of trains on many routes besides those of a standard character.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] [*C. Christy.*

LONDON & NORTH EASTERN RAILWAY.

Double-headed express near Chelmsford.
Great Eastern 4-4-0 and 4-6-0 locomotives.

ONE is not accustomed to search the columns of the daily newspapers for reliable facts and figures relating to railways. With the exception of the *Daily Telegraph*, which is generally accurate in its railway references, and certain other of the more reputable and level-headed journals, the average newspaper seems well-nigh incapable of referring to the railway, in no matter what sphere of its activity, without some misstatement or other. One priceless allusion of this character that occurs to mind was made by a newspaper whose record in the matter of daily net sales was only equalled by the record boiler pressure of a certain new locomotive type, which the paper gravely announced to be no less than 200 *tons* per square inch; on another occasion the same newspaper published an indignant letter from a correspondent, after a severe accident to a night express, demanding to know why the safety of passengers should not be consulted by the exhibition of signal lights at night! But when a journal with the reputation of the *Morning Post* lends its columns to an article which contains such a veritable tissue of misrepresentation concerning British railways as that which appeared in the April 2nd issue, under the caption "Faster Railway Travel—Are Our Expresses Too Slow?" one is frankly amazed. Especially so, too, in that the article does not appear as "From a Correspondent," but rather as the considered opinion of the newspaper itself.

The article under review answers its own question with a very emphatic affirmative. It commences by referring to the affection and pride with which we used to regard the famous expresses of bygone days, such as the "Zulu," the "Scotchman" and the "Flying Dutchman," and speaks of the waning of these sentiments, as expressed in such "incomparably less picturesque" appellations as "Cornish Riviera Express, Limited" (*sic*), or, worse still, no nickname at all. "The lure of speed" we are told "which has always enticed our race, and against which even the Miltonic angels are not proof, remains with us." Then, after having reminded us that recent talk of electrification has conjured up visions of increased speed, the writer puts what he imagines to be the query of the hour: "One naturally asks why, if it is simply a question of power, a good deal more cannot be done with steam."

A moment later he supplies his own all-

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sufficient answer. "Anyone can see for themselves that the locomotives on the majority of lines are ridiculously inadequate and small." Without stopping to comment on the grammatical construction of the last sentence, we are appalled to note in the next that "our American visitors" call these inadequate machines "Toy engines." "The fact is that locomotive engineers in this country have not been equal to the tasks required of them, and the general managers have lent too ready an ear to the permanent-way department, which dislikes to have its roadbed disturbed by high speeds. Our stricted loading gauges, but it would be idle to pretend that they exploit their present resources to the full extent."

Out of this mass of "expert" opinion one extracts the following startling conclusions :—

(*a*) That "notions of economy" in the mind of a locomotive engineer must on no account be tolerated. One had always thought previously that economy and efficiency were the two main objectives he had to keep in view.

(*b*) That superheating is the principal drag on the wheels of progress. Supported by the detailed figures of some fourteen

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*R. Hogan.*

Blackpool–Bradford express passing Church. Rebuilt 4-6-0 locomotive No. 1522.

locomotives, for one thing, have been built to last too long, the result being that you can still see twenty-five and thirty-year-old engines hauling our main line trains. Their designers, for another, have been possessed by notions of economy, and thanks to the introduction of superheating, have not gone boldly forward, as have French and American engineers, with the main problem—the increasing of the boiler area and the heating surface. The 'Pacific' type of locomotive is still rare in this country, and is not, we believe, standard on any of our lines. Yet it is generally used in France. Certainly our engineers are hampered with their re-

years of continuous travel, certain of which have been quoted as evidence in the last two articles of this series, one had ventured to imagine, on the contrary, that the introduction of superheating had proved the greatest enhancement of British locomotive efficiency during the past half-century.

(*c*) That the be-all and end-all of locomotive design is the "increasing of the boiler area." "Boiler area"? With all humility one asks—what *is* it? Anyhow, the increase of the "boiler area," with that companion panacea of all the ills that the locomotive is heir to—the heating surface—may be seen in all their

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glory in France and America, where, be it noted, the average speed of express trains is considerably lower than it is in this country. This last fact reacts rather unfortunately on the cogency of the writer's argument, but it is one of the many of which he is blissfully unaware.

Where one joins issue the most forcibly with the article, however, is in regard to the table in which the writer purports to represent current British train speeds. This table shows what the writer describes as the "quickest trains" from London to Cambridge, Folkestone, Margate, Bath, Bournemouth, Southampton, Brighton, Manchester, Newcastle, Crewe and Birmingham. Out of the eleven times given *six* are incorrect; Cambridge is shown as 7 min. further off than it really is, Folkestone as 5 min., Margate as 11 min., Manchester as 30 min., Newcastle as 10 min., and Crewe as 6 min., every error being against the railway and to the advantage of the argument. A mile is lopped off the Margate distance and ¾-mile off that to Cambridge, again to the advantage of the argument. Then we read "Not that the majority of our expresses reach sixty or even fifty miles an hour. Instead of a mile-a-minute being the normal timing of a fast train, a perusal of Bradshaw reveals the fact that only one express train runs from start-to-stop at an average speed of sixty miles an hour, this being the 11 a.m. from Paddington to Bath, which covers the 106¾ miles in 105 min., a rate of approximately 61 miles an hour."

It would be deeply interesting to know what was the precise issue of Bradshaw perused by this would-be speed authority. "Only *one* express train runs from start-to-stop at an average speed of sixty miles an hour"! And in point of fact, if odd decimal points be discarded—*i.e.*, if 19·9 miles be considered as 20, and 18·9 as 19, which is rather less exceptionable than the ¾-mile and the 1 mile that the writer conveniently discards to assist *his* argument—we have, not *one* 60-m.p.h. run, but *ten* in this country daily! No other country in the world—not even France and America, going "boldly forward" to vast and highly commendable "boiler areas"—can produce a single one. And after the ten, it is possible to count yet another 12 at 58 m.p.h. and over! One would hesitate to suppose that the author of these railway "facts" ever so much as sets eyes on a railway publication, or one might be tempted to ask his opinion of the "British Locomotive Practice and Performance" articles in this journal

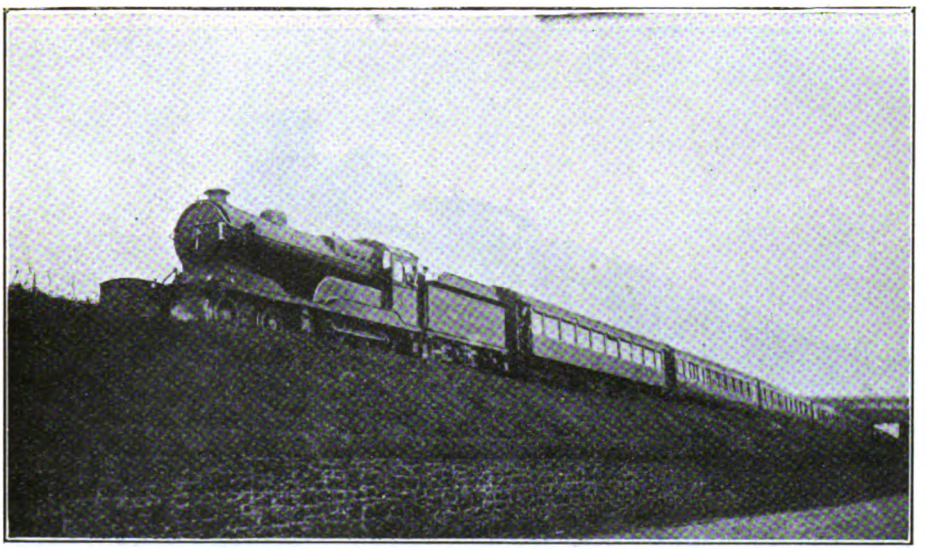

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*W. H. Whitworth.*

Restaurant car express leaving Godley. Great Central 4–4–0 locomotive No. 510, "Princess Mary."

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during the past two months. And, again, of the performance section in the latter half of the present article.

Sixty-three miles out of one continuous journey on the Great Western, for example, at an *average* speed of 75 miles per hour; 32 consecutive miles on the North Eastern at the same average; start-to-stop averages of well above 60 miles per hour over 100-mile lengths of the North Western main line by engines between 15 and 20 years old; very nearly the same thing on the Midland, over a hard road; and now, in this issue, run after run on the Great Central at higher than a mile-a-minute start-to-stop average, and with a maximum recorded speed of 90 miles an hour. What has he to say to such figures as these? Where can he produce their parallel the world over at the present time?

Perhaps the most objectionable of all the statements contained in the article under review was this: "When it is remembered that on long-distance trains unpunctuality, if only of ten minutes or a quarter of an hour, is the rule rather than the exception, these figures are even more lamentable." The writer has not a tittle of evidence on which to base so palpably false a contention. To take but one example from my present note-book, I have therein the record of 44 long-distance journeys over the Great Northern main line during a period of fifteen months prior to writing the present article. Of these, on 33 occasions we were on time on arrival, or anything up to 4 min. early. On seven more trips we were from 1 to 4 min. late. Setting late arrivals against early, and taking an average, we were on time on 91 per cent. of the journeys made, *i.e.*, on 40 trips. Of the remaining four, a non-superheated "Atlantic" lost badly on the 10.10 a.m. down, and made us 9 min. late into Doncaster; the 5.30 p.m. down lost 10 min. to York with an exceptional load on a snowy night; on the colossal 1.55 p.m. into King's Cross a perfect hurricane of a gale, as described in the February issue, made one of the "Pacifics" 20 min. late into King's Cross; and, lastly, a hot big-end on the 5.30 p.m. down one day last summer necessitated the removal of our engine at Newark, and we reached Doncaster 54 min. late. The bulk of these runs were at week-ends, when there is more liability to unpunctual running than on ordinary week-days. Had I included a number of further runs, on light or otherwise uninteresting trains which I did not trouble to time, and on

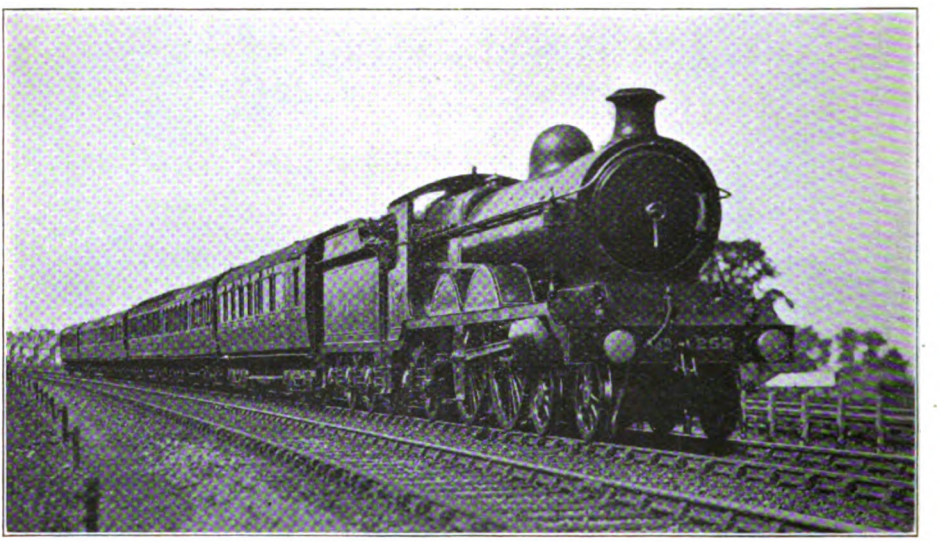

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*F. E. Mackay.*

Up Manchester and Halifax to Marylebone express.
Great Central three-cylinder compound 4-4-2 engine, No. 259.

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which arrivals were almost invariably punctual, the percentage of arrivals to time would have been raised well above 90. I gave very similar figures in regard to the Midland Railway a few months ago, and could go on quoting them indefinitely in respect of other railways.

What really is lamentable is that a newspaper of such standing should lend its columns for the reception of an article, purporting to be an authoritative *exposé* of current railway conditions in this country, the writer of which is unable to copy figures out of " Bradshaw " without getting more than half of them in error, which lays lack of speed at the door of the British locomotive designer, and attributes it to the inefficiency of his creations. It is also beyond dispute that the country which employs out-of-date " toys " to run its express train services has, or will have by the coming summer, restored the whole of its express train services to their pre-war speed level, which no other country in the world—belligerent or neutral—has yet succeeded in doing; and, further, we are promised such summer developments as the London and North Eastern non-stop service between King's Cross and Leeds, in 3 hours

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*H. Gordon Tidey.*

Down express on Highland section. Highland 4–6–0 locomotive, " Ballindalloch Castle."

and who, it is very evident, is totally unfamiliar with the subject in which he presumes to attempt to educate the public. The kindest possible construction on the matter is to assume that the succession of mis-statements arises from crass ignorance rather than from *malice prépense*. That British express locomotives are capable of higher average speeds than is demanded of them by current time-tables is not in dispute. My last two articles have made this abundantly clear, and at the commencement of my April article I laboured this very point, in referring to the certain aerial competition of the future. This is, however, a very different claim to that 25 min. in both directions, which, so far as the down journey at least is concerned, will bring Leeds nearer to London than it has ever been previously in all its history.

It is a relief to turn now from wild fiction to sober fact, as embodied in the welcome accelerations which the April time-tables produced in the service of the Western section of the London Midland and Scottish Railway, better known as the late London and North Western. It is, indeed, pleasant to see Manchester brought again within 3½ hours of Euston, and also Lime Street at Liverpool within 3 hours 40 min. of town. This is achieved

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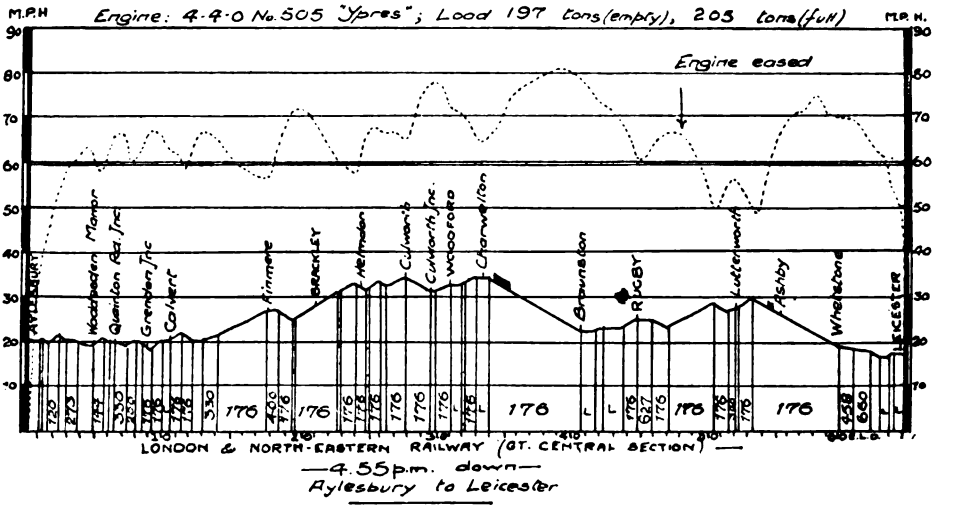
by the reinstatement of the pre-war 5.55 p.m. down Liverpool, and 6.5 p.m. down Manchester, in exactly their old times, with non-stop runs to Edge Hill and Wilmslow, in 213 min. and 191 min., respectively for the distances of 192·3 and 176·9 miles. Similarly, the 9.45 a.m. from Manchester to London cuts out Stafford and Rugby from its schedule, and reaches Euston at 1.15 instead of 1.45 p.m. The latter alteration has involved the running of a special Birkenhead and Coventry express, leaving Crewe at 10 a.m. and Rugby at 11.31 p.m., from which a non-stop run is made to Euston in

The 10.40 a.m. (late 10.30 a.m.) down Manchester still carries its weighty "tail" for Blackpool, Windermere and Whitehaven, not to mention Colne and Halifax, and has to be piloted daily; it is diverted from the Styal to the Stockport route north of Crewe, and will have no time to spare in running from Crewe to London Road in 40 min., inclusive of the stop to detach at Stockport. In this case 20 min. clear is cut from running times, with no reduction in the number of stoppages. So Manchester gets one down express in 3½ hours, one in 3 hours 40 min., two in 3 hours 50 min., and two



GRADIENT PROFILE AND RUNNING DIAGRAM, AYLESBURY TO LEICESTER, GREAT CENTRAL SECTION, LONDON & NORTH EASTERN RAILWAY.

89 min. At long last the Willesden stop is cut out of the schedule of the 12.5 p.m. from Manchester to Euston, the 145·5 miles from Stoke to Euston being run non-stop in 162 min.; but with one stop less, and a shorter halt than previously at Macclesfield (where tickets were collected in pre-war days), the actual running speed is a little lower than in 1914, though the overall time of 3 hours 50 min. is the same. A new and exceedingly useful train is the 8.45 a.m. down Manchester, calling at Rugby (in 91 min. from Euston), Stoke, Congleton, Macclesfield and Stockport, and completing the journey in 5 min. under 4 hours.

in 3 hours 55 min.; in the reverse direction one in 3½ hours, one in 3¾ hours, one in 3 hours 50 min., one in 3 hours 55 min., and two in 4 hours are the chief facilities. There is no express up from Liverpool in less than 4 hours, which is the general allowance in both directions, but in addition to the 3 hours 40 min. of the 6.5 p.m. down, the 10.30 a.m. reaches Lime Street in 3 hours 50 min., and the 11.50 a.m. in 5 min. more.

To Crewe 175 min. is now quite a common start-to-stop time; it is performed four times daily going down and once up; similarly timings of 90, 91 and 92 min. (with one up in 89 and one in 88 min.)

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L. & N.E.R. (GREAT CENTRAL SECTION): MARYLEBONE–NOTTINGHAM.

Train ex-Marylebone:			2.32 A.M.						4.55 P.M.					
4–4–0 Engine No.:			363	†509	*510	‡501			437	505	433	506		
Engine Name:			Unnamed "Atlantic."	*Prince Albert.*	*Princess Mary.*	*Mons.*			*Prince George.*	*Ypres.*	*Walter Burgh Gair.*	*Butler-Henderson.*		
Load (axles):			20	24	28	26			20	20	20	24		
Load (tons tare):			120	140	185	160			157	157	157	198		
Load (tons full):	Distance.	Schedule.	135	155	200	175	Distance.	Schedule.	165	165	165	210		
	mls.	min	m. s.	m. s.	m. s.	m. s.	mls.	min	m. s.	m. s.	m. s.	m. s.		
Marylebone	0·0	0	0 00	0 00	0 00	0 00	0·0	0	0 00	0 00	—	—		
Neasden Junction	5·1	—	7 47	8 25	8 20	8 25	5·1	—	8 05	7 55	—	—		
Harrow	9·2	13	11 47	12 35	12 25	12 35	9·2	14	12 25	11 50	—	—		
Northwood	13·7	—	16 11	17 35	17 20	17 25	13·7	—	17 05	16 15	—	—		
Rickmansworth	17·2	—	19 29	21 25	20 40	20 55	17·2	—	20 30	19 40	—	—		
Chorley Wood	19·4	—	22 55	24 35	23 40	24 35	19·4	—	23 45	22 55	—	—		
Chalfont Road	21·6	—	26 03	27 50	26 45	28 10	21·6	—	26 55	26 20	—	—		
Amersham	23·6	—	28 56	30 35	29 20	31 35	23·6	—	29 55	29 30	—	—		
Great Missenden	28·8	—	33 42	35 25	34 10	36 55	28·8	—	34 55	34 25	—	—		
Wendover	33·3	—	37 59	9 50	38 30	41 15	33·3	—	39 20 p.w.r.	38 35	—	—		
Aylesbury	38·0	44	42 14	43 50	42 20	45 05	38·0	46	44 45	43 50	0 00	0 00		
Quainton Road Junction ..	44·4	52	48 19	50 05	48 40	52 05	6·4	8	8 10	8 10	8 10	8 25		
Grendon Junction ..	46·8	—	50 48	52 25	51 00	54 45	8·8	—	10 40	10 25	10 45	11 10		
Calvert	48·8	—	52 42	54 35	52 55	56 45	10·8	—	12 30	12 20	12 35	13 15		
Finmere	54·5	—	57 57	60 25	58 45	63 20	16·5	—	18 05	17 55	18 00	19 00		
Brackley	59·3	67	62 49	65 55	64 15	68 40	21·3	—	23 05	22 30	22 35	23 50		
Helmdon	3·2	—	5 08	5 05	5 25	5 20	24·5	—	26 40	25 50	25 55	27 45		
Culworth	6·8	—	8 25	8 35	8 50	9 00	28·1	—	30 10	29 00	29 15	31 00		
Woodford	9·8	—	10 50	11 30	11 20	11 40	31·1	32	32 50	31 30	31 45	34 00		
Charwelton	12·2	—	12 57	13 40	13 35 sigs.	13 55 sl t.	33·5	—	35 10	33 40	34 00	36 25		
Braunston	19·2	—	18 37	19 45	19 40	19 35	40·5	—	41 15	39 25	39 55	42 30		
Rugby	23·9	24	23 10	24 00	24 05	23 40	45·2	—	45 25	43 35	44 00	46 20		
Lutterworth	6·8	—	8 02	8 10	8 10	8 10	52·0	—	52 10	50 45	50 50	52 55		
Ashby	10·7	—	11 29 p.w.r.	11 50	13 20 sigs.	11 35	55·9	—	56 00	54 55	54 50	56 15		
Whetstone	15·2	—	15 54	15 25	17 25	14 55	60·4	—	59 50	58 45	58 35	60 05		
Leicester	19·9	20	19 58	19 55	22 35	18 55	65·1	65	64 50	63 25	63 20	64 15		
Belgrave	2·3	—	3 54	4 00	4 10	3 45	—	—	—	—	—	—		
Rothley	5·0	—	6 35	6 50	7 00	6 30	—	—	—	—	—	—		
Loughborough	9·8	—	10 23	11 00	11 20	10 20	—	—	—	—	—	—		
East Leake	14·4	—	14 22	14 40	15 15	14 00	—	—	—	—	—	—		
Ruddington	19·0	—	18 00	18 25	19 30	17 30	—	—	—	—	—	—		
Arkwright Street	22·5	22	21 22	22 00	23 05	21 15	—	—	—	—	—	—		

* 4–4–2 No. 264 from Leicester. With 160 tons only (20 axles).

† 4–4–2 No. 267 from Leicester. With 110 tons only (16 axles).

‡ 4–4–2 No. 360 from Leicester. With 150 tons only (20 axles).

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are plentiful between Euston and Rugby, which is better off in relation to London than it has ever been previously. On the Birmingham service the 1.15 p.m. down is added to the 2.20 and the 5.50 p.m. down and the 1.0 and 6.20 p.m. up as making the Coventry stop within the two-hour schedule; in the up direction, with only 2 min. additional allowance, the 4.58 p.m. (late 5.0 p.m.) from New Street is now booked to call at Rugby, and has to run from Birmingham to Euston in 2 hours, 22 min., inclusive of 7 min. standing at Coventry, Rugby, Northampton and Watford, not to mention the extra 2·3¼ miles (total 115·2 miles) and on the up Manchester 3½-hour express, on which I have not yet had the opportunity of travelling myself, but which I expect to sample within the next few weeks. The engine on this occasion was an unnamed "Claughton," of which my friend unfortunately omitted to record the number, and the load the customary L. & Y. set which is run on this train, consisting from Wilmslow of seven 8-wheelers, and a 12-wheeled dining car, 225 tons empty and 235 tons with passengers and luggage. The London Road to Wilmslow run, with 155 tons, was first made in 15 min. 47 sec. After a halt of 8 min. 50 sec., the "Claughton" got

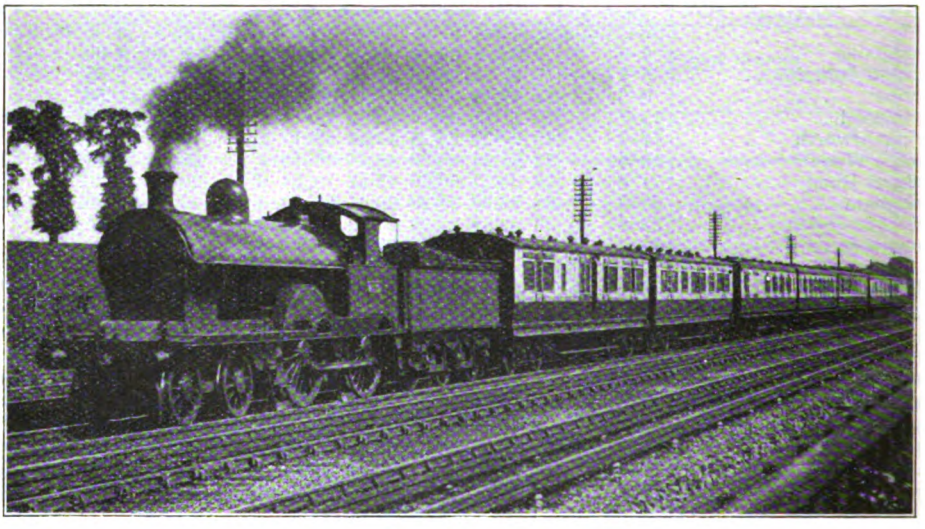

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*F. E. Mackay.*

Euston–Birmingham 2 hour express.

the hard grades of the Northampton loop. This Rugby insertion has necessitated the addition of this express to the existing two booked over the 18·9 miles from Birmingham to Coventry in 19 min., start-to-stop. And, finally, a service of 40-minute expresses is restored between Lime Street, Liverpool, and the Exchange Station at Manchester. Altogether this is quite a cheering speed-up, and makes one's anticipations the keener of the accelerations which are without doubt to take place in the coming summer, especially on the London and North Eastern system.

By the kindness of a correspondent I am able to give some details of running away in tremendous style, attaining 78 m.p.h. on little easier than level grades—not quite up to the Great Western and North Eastern maxima of recent issues, but very close—and passing the 159 mile-post, 17·9 miles, in 17 min. 55 sec., or less than "even" time. But by reason of a severe signal check, the mile thence to Crewe occupied 2¼ min., and Crewe was passed at well below the normal speed. On the 1 in 177 of Madeley Bank the minimum speed was 45 m.p.h., and an acceleration to 49 was registered before the 148 mile-post (the summit) was breasted, 28·9 miles, in 34½ min. from the start. From there to Willesden, 142·5

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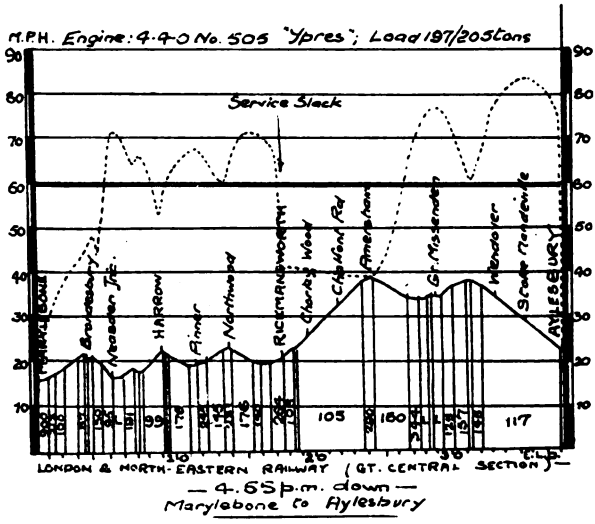
miles, the train was run in 140 min. 35 sec., without exceptional speeds at any point; in fact, the maxima were only 70 m.p.h. at Great Bridgeford, 72 at Hademore troughs, and 74 at King's Langley.

Times into Euston were 162 min. 55 sec. from Crewe (158·1 miles); 135¼ min. from Stafford, 133·6 miles; 111 min. 55 sec. from Tamworth, 110 miles; 99 min. 10 sec. from Nuneaton, 97·1 miles; 84 min. from Rugby, 82·6 miles; 60 min. 12 sec. from the 60th mile-post (Roade summit); 48 min. from Bletchley, 46·7 miles; 32 min. 35 sec. from Tring, 31·7 miles, passed at a minimum of 52 m.p.h.; 20 min. 23 sec. from Watford, after which the engine was clearly eased, and 8 min. from Willesden Junction. This made a total of 183 min. 5 sec., or rather over 181 min. net, for the 176·9 miles from Wilmslow, which, after allowing for the service slacks at Crewe, Stafford, Rugby and Camden, means a full average sixty-mile-an-hour gait throughout. Actual running time from Manchester to Euston was 198 min. 52 sec. for the 188·5 miles, or a little more than 197 min. net, allowing for the signal delay, which shows that even the 3½-hour schedule leaves something in hand with the modern locomotive stock. The train arrived 2¼ min. early, and when I last saw it, arriving in charge of a "Prince," the time of stopping was only 1.14 p.m., or a minute early. As the booked allowance for stopping to attach at Wilmslow is only 6 min., the "Claughton" on my correspondent's fine run had gained some 7 min. net on booked time.

I now come to the *pièce de resistance* of the present article, which is the table of Great Central runs reproduced herewith—at least, they were Great Central when recorded, before that company was swallowed up in the capacious maw of the London and North Eastern group. Four of them were made on that tremendously attractive but, to the recorder of times, abominably inconvenient 2.32 a.m. from Marylebone, which in its northward flight boasts no less than *three* start-to-stop snippets at the "sixty" mark or over—Brackley to Rugby, 23·9 miles in 24 min.; Rugby to Leicester, 19·9 miles, in 20 min.; and Leicester to Arkwright Street, 22·5 miles in 22 min. The overall time is slightly longer than before the war, both because the initial and heavily-graded 59·3 miles to Brackley are now allowed 67 instead of 64 min. (Brackley is a working stop not shown in the public tables), and also because rather longer stops are allowed at intermediate points. The train itself is always now considerably heavier than it was in pre-war days. Of the four runs, the first is of my own timing, and for the remainder I am indebted to correspondents whose enthusiasm has been sufficient to drag them out of their beds at this uncomfortable hour. Then follow four runs on the 4.55 p.m. down, which distinguishes itself by covering the 65·1 miles from Aylesbury to Leicester start-to-start in 65 min.—or generally less! The first of these is mine, and the other three have also been timed by friends.

My own first run was one of the peerless efforts of Driver Bailey, now, alas! re-



GRADIENT PROFILE AND RUNNING DIAGRAM, MARYLEBONE TO AYLESBURY, GREAT CENTRAL SECTION, LONDON & NORTH EASTERN RAILWAY.

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tired; it was timed and described in these columns a number of years ago. Its chief feature was the extraordinary excellence of the starts, which in point of time beat those of every other run, except the very slight advantage held by *Mons* out of Leicester. Speed was 71½ m.p.h. at Neasden Junction, 67 at Pinner, and 74 before Rickmansworth, where the most careful reduction of all the trips (except that of *Mons*) was made. Up the continuous 1 in 105 from Rickmansworth to Amersham the maintained speed was 42½ m.p.h., and we then touched 75 at Missenden "dip," and fell only to in 23 min. 10 sec. On the next "snippet," after touching 68 m.p.h. at Lutterworth, and getting to 75 on Ashby bank, we encountered a relaying check; nothing daunted, Bailey put on full steam again, reached 82 m.p.h. below Whetstone, and actually finished his 19·9 miles in 2 sec. under 20 min., delay included! As a joyous conclusion, we attained 83½ m.p.h. at both Loughborough and Ruddington, with an intervening minimum of 67 at Barnston Summit (after 2¼ miles up at 1 in 176), and so actually gained over half-a-minute, covering the 22·5 miles start-to-stop in 21 min. 22 sec. Allowing

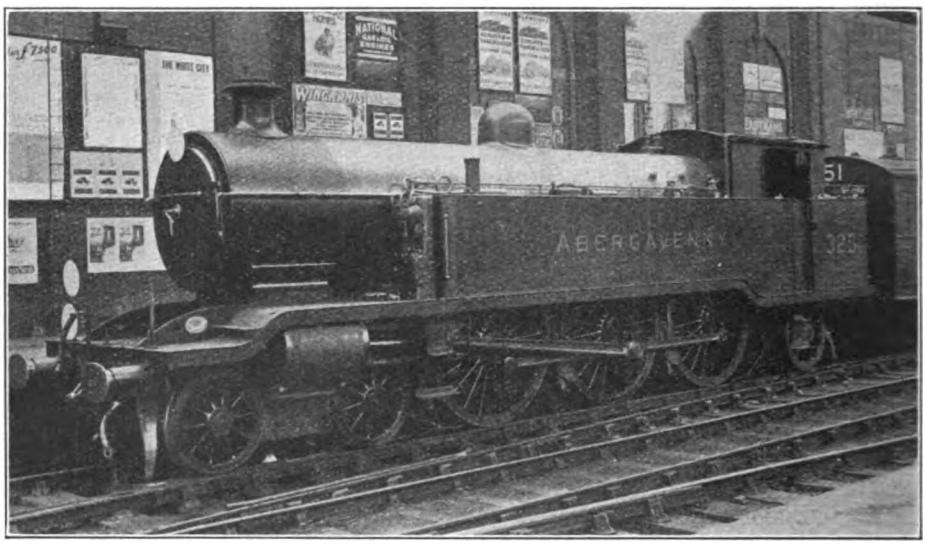

Photo.] SOUTHERN RAILWAY. [*O. J. Morris.*

London, Brighton & South Coast express 4–6–2 tank engine, No. 325, "Abergavenny." As now running with Ross safety valves and detail changes.

57½ on the subsequent 1¾ miles up at 1 in 125-157, before the rigid restriction of speed from Wendover down to Aylesbury (maximum only 67 m.p.h.) which is evident from the times. But some grand running was made from Grendon up to Brackley, a speed of 60 m.p.h. being kept up on the long stretch at 1 in 176 to Finmere, preceded and followed by maxima of 71½ and 75 m.p.h. on the adjacent short declines.

On restarting from Brackley with 125 tons, we touched 79 m.p.h. at Culworth Junction, only fell to 67 at Charwelton, and then reached 82 at Braunston, covering the 23·9 miles to Rugby, with a 3-mile rise at 1 in 176 from the dead start, 1¼ min. for the Ashby check, Bailey gained in all no less than 7 min. on the present-day schedule, his actual running times being 127 min. 19 sec., and his net running times (including three starts and three stops) 126 min. for this 125·6 miles of exceedingly hard road.

The correspondent who forwarded the second run gave no details of his speeds, but it will be seen that 65 sec. were gained to Brackley, while the three following schedules were kept with scrupulous exactness. For an "Atlantic" the work beyond Leicester was good, although not up to that of Bailey, as the load was 10 tons less and the time 38 sec. more.

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Princess Mary had the heaviest train of the series to Leicester, but did some fine work to reach Brackley in 2¾ min. under time with 200 tons, which is nearly equal to a six-coach train of the heaviest stock. Touching 71 m.p.h. at Neasden, she went up the 1½ miles at 1 in 94-105 to Harrow at a minimum of 44; the rate to Pinner was 59½ m.p.h., at Northwood summit 51, and before Rickmansworth 73½ m.p.h. Then she fell gradually from 46 to 43 m.p.h. on Chalfont Road bank, but touched 78 m.p.h. at Missenden dip, and 85 before Aylesbury, where a slack was made to about 60 m.p.h. On the two stretches at 1 in 176 before Brackley the minima were 54 m.p.h., with maxima on the short dips of 67½ and 69 m.p.h. On leaving Brackley the engine accelerated to 50 m.p.h. up 1 in 176—an exceedingly fine feat with this load—touched 73½ at Culworth Junction, fell to 60 at Charwelton and got signals very slightly on at Staverton Road, but attained 80 at Braunston, and was running at 71 when steam was shut off for Rugby. Then, unfortunately, there came a prolonged slowing for signals at Lutterworth station to 25 m.p.h., followed by a maximum of only 71 on Ashby bank, so that 2½ min. were lost between Rugby and Leicester. After Leicester, also, 4-4-2 No. 264, with the reduced load of 160 tons, lost another minute to Nottingham, despite a maximum of 80 m.p.h. at Ruddington; at Loughborough the rate was only 73 m.p.h., and at Barnston speed fell to 57½ m.p.h.

The poorest part of the running made by *Mons*—if it is possible to describe as "poor" a loss of 1¾ min. on such lightning bookings as these—was between Marylebone and Brackley, but to the credit of engine and driver be it said that the loss was more than regained on the far harder schedules north of Brackley. Touching 68½ m.p.h. at Neasden, *Mons* fell to 45 at Harrow and 53 at Northwood, and rose to 69 before Rickmansworth; then the speed on Chalfont Road bank gradually dwindled to 34 mp.h.; maxima were 70½ m.p.h. before Missenden and 80½ before Aylesbury, with a slack to as low as 51 m.p.h. through that town; and the speed up the Finmere 1 in 176 fell to 53½ m.p.h. But there were no half-measures about the subsequent running. Touching 71½ m.p.h. at Culworth Junction, and only falling to 61 at Charwelton, *Mons* accelerated rapidly down Catesby bank to a maximum of no less than 90 m.p.h. at Braunston—a speed which the extraordinary time from Braunston to Rugby stop fully bears out. I might also add that I have every confidence in the accuracy of my correspondent's timing. Again, between Ashby and Whetstone speed rose to 85 m.p.h.—the average, indeed, was 84·6 m.p.h. between the two stations—and the perfectly astounding time of 18 min. 55 sec. was achieved for the 19·9 miles from Rugby to Leicester, start-to-stop. Not to be outdone, "Atlantic" No. 360 then came on to the reduced load of 150 tons, made a still more amazing start to Rothley than that of No. 363, touched 85 m.p.h. at Loughborough, actually breasted Barnston Summit at 69, reached 86½ at Ruddington, and gained ¾-min. to Arkwright Street, despite a slow stop, without which the start-to-stop time for 22½ miles might have been less than 21 min.! Small wonder that my correspondent, who is an enthusiast of the first water, waxed lyrical in his letter to me as to the magnificent results which had attended his quest for high speeds in the very "small" hours.

Running on the 4.55 p.m. down is but little less enterprising. On my own trip with *Prince George*, we passed Neasden at 67 m.p.h., Harrow at 46, Pinner at 64½, Northwood at 55, Sandy Lodge at 72½, Rickmansworth (service slack) at 37, maintained 43-42 m.p.h. up Chalfont Road bank, touched 74 before and fell to 53½ after Missenden, and then reached 75 m.p.h. before the p.w.r. slack which preceded Aylesbury stop. Net time to Aylesbury was little, if at all, over 44 min. Thence, slacking at Quainton Road, we touched 67 m.p.h. at Grendon Junction and again after Finmere, mounted both long 1 in 176 banks at 53 m.p.h., well sustained, touched 72½ m.p.h. at Culworth Junction and fell to 61½ at Charwelton, and then reached 80½ m.p.h. at Braunston and 77½ at Whetstone, with intervening minima of 60 at Rugby and 53 before Lutterworth. We finished in very leisurely fashion, but still inside schedule time.

The run made by *Ypres* in the next column was considerably more energetic, and by the kindness of the correspondent concerned I am able to reproduce herewith

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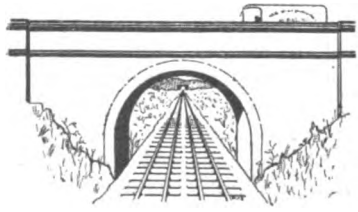
carefully-compiled graphs of the speeds on the two portions of the run, which he has prepared. *Ypres* gained on *Prince George* by a maximum of 71 m.p.h. at Neasden and a minimum as high as 53 m.p.h. at Harrow, with the higher speeds also of 68 m.p.h. at Pinner, and 60 at Northwood; but the climbing from Rickmansworth to Amersham was inferior, with speed dropping gradually from 40 to 38½ m.p.h. A rate of 77 m.p.h. was attained before Missenden; the subsequent minimum was as high as 60; and 83½ was touched before Aylesbury stop, which was very slowly made. Then followed some exceedingly fine running; on neither long 1 in 176 grade, flanked by maxima of 67 at Grendon, 67 beyond Calvert, and 71½ before Brackley, did the rate drop below 58 m.p.h.; 78 was attained at Culworth Junction and 80½ at Braunston, separated by a minimum of 64½ at Charwelton; and then, after Rugby, passed well inside "even time," the engine was eased to avoid too early an arrival. Two minutes might easily have been saved beyond Rugby; but as it was the 65·1 miles were completed in 63 min. 25 sec., over 1½ min. inside "time." The next run, in connection with which the correspondent concerned furnished no maximum and minimum speeds, was almost identical in its times (save for a slower passage of Quainton Road Junction) than the one just described as far as Helmdon, after which it drops from 5 sec. behind at that station to ½-min. behind at Braunston; but after that *Walter Burgh Gair* overhauled and passed *Ypres* near Ashby, and got into Leicester first by 5 sec.

In the last column is shown the journey of another correspondent, hailing from Leicester, made on Easter Tuesday last, with a load rather above normal. Details in the log are scanty as far as Aylesbury, to which point the engine ran in 45½ min., gaining ½-min. Then the increased load told somewhat as far as Culworth, Finmere bank reducing the speed to 53 m.p.h., and Brackley bank to 50, with maxima of 64 m.p.h. at Grendon, and 69 before Brackley. But from Culworth Junction, where speed got up to 75 m.p.h., a sterling effort was made to avoid a late arrival; minima of 56 m.p.h. at Charwelton, 64 at Rugby and 56 before Lutterworth were separated by maxima of 82 at Braunston, 72 beyond Rugby and 82 again near both Ashby and Whetstone. So *Butler-Henderson* succeeded in gaining ¾-min. to Leicester.

A review of these performances shows how utterly they refute, in every single particular, the *Morning Post* effusion dealt with in the earlier part of the present article. As regards punctuality, out of 24 start-to-stop runs described, in every case booked at exceedingly high speeds, schedule time was exceeded in one case by 2½ min., owing to a signal delay; in another by 1¾ min., subsequently retrieved by the same engine; and in yet another by 1 min.; in all other cases arrivals were punctual or early. As regards speed, on the eight Great Central Railway journeys the "ridiculously inadequate and small" 4-4-0 and 4-4-2 engines used gave maximum speed records of 90 m.p.h. once, 86½ once, 85 three times, 83½ three times, 82 four times, 80½ five times, 79 once, 77½-78 four times, and 75 six times, all at totally distinct locations. And the two runs out of six on which the recorders gave no details of speeds attained would certainly add to this number. If the permanent-way department of the London and North Eastern Railway "dislikes to have its road-bed disturbed by high speeds," there is precious little evidence of this antipathy on the Great Central section!



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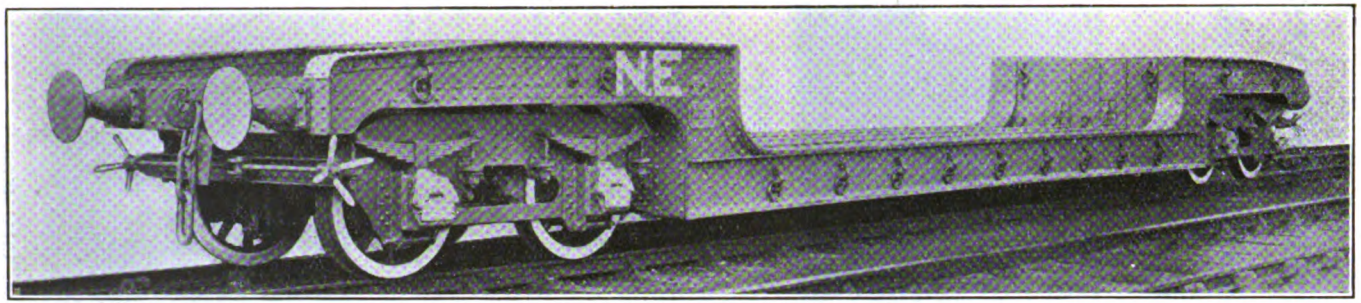
50-TON TROLLEY WAGON, LONDON AND NORTH EASTERN RAILWAY.



A NUMBER of wagons of special types were recently built by Stableford & Co., Limited, Coalville, to the designs of Sir Vincent L. Raven, late Chief Mechanical Engineer, North Eastern Railway Company, for service on that system. A 50-ton trolley wagon is illustrated. It measures 48 ft. 8 in. long over headstocks and 7 ft. 9 in. over solebars and is constructed, as are the other vehicles described, entirely of steel. The solebars are built up of $\frac{5}{8}$-in. plates and $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by 11 lb. angles top and bottom, with 12 in. by $\frac{1}{2}$ in. bars covering same. In the well portion of the vehicle, two 15 in. by 4 in. by 42 lb. channels are used, placed back to back, with a space of 4 in. between, the longitudes being of similar construction. The bogies are of specially strong construction, being built up of $\frac{5}{8}$-in. plates, channels and angles and are fitted with wheels and axles, having both inside and outside journals, the former measuring 10 in. by $5\frac{1}{2}$ in., and the latter 10 in. by 5 in. diam. A hand brake of the screw type operating from both sides of the vehicle is fitted to each bogie, blocks being supplied to all wheels. The bearing springs, of which there are eight to a bogie, are of the laminated pattern, having seven plates 4 in. by $\frac{5}{8}$ in. The drawgear pulls on to specially strong headstocks, the springs being of indiarubber, $9\frac{1}{2}$ in. diam. Buffers are self-contained, having cast-steel cases and indiarubber springs.

Other vehicles include a 40-ton trolley wagon measuring 55 ft. 6 in. over headstocks, with a well 34 ft. 6 in. long and a total wheelbase of 51 ft.; a 40-ton propeller trolley wagon, 46 ft. over headstocks, with a 25 ft. well and a width of 8 ft. 4 in. over solebars; a four-wheeled 20-ton trolley wagon, 28 ft. over headstocks, and 8 ft. 6 in. wide, the well portion being 17 ft. 10 in. long, and the wheelbase 22 ft.; and a 35-ton boiler wagon, 40 ft. over headstocks and having an extreme width of 8 ft. 1 in.

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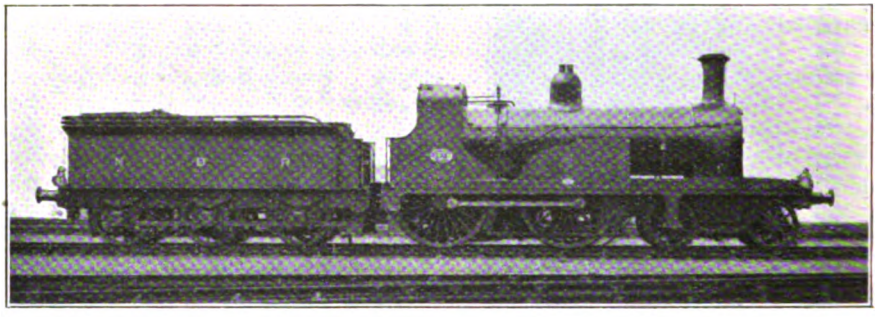
REBUILT PASSENGER LOCOMOTIVES,

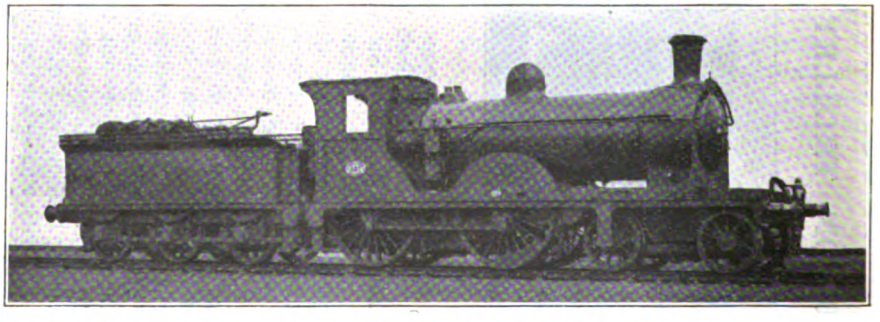
LONDON AND NORTH EASTERN RAILWAY (NORTH BRITISH SECTION).

Mr. W. CHALMERS, Mechanical Engineer.



AS ORIGINALLY INTRODUCED BY MR. M. HOLMES.

	As built.	*As rebuilt.*
Cylinders	18 in. × 26 in.	18½ in. × 26 in.
Coupled wheels, diam.	6 ft. 6 in.	6 ft. 6 in.
Wheelbase, engine	22 ft. 1 in.	22 ft. 1 in.
Heating surface—		
Firebox	118 sq. ft.	120·1 sq. ft.
Tubes	1,144 sq. ft.	1,146 sq. ft.
Total	1,262 sq. ft.	1,266·1 sq. ft.
Grate area	20 sq. ft.	19·47 sq. ft.
Boiler pressure	140 lb. per sq. in.	175 lb. per sq. in.
Weight of engine and tender	72 tons	79 tons 17 cwt 2 qr.



AS REBUILT BY MR. W. CHALMERS.

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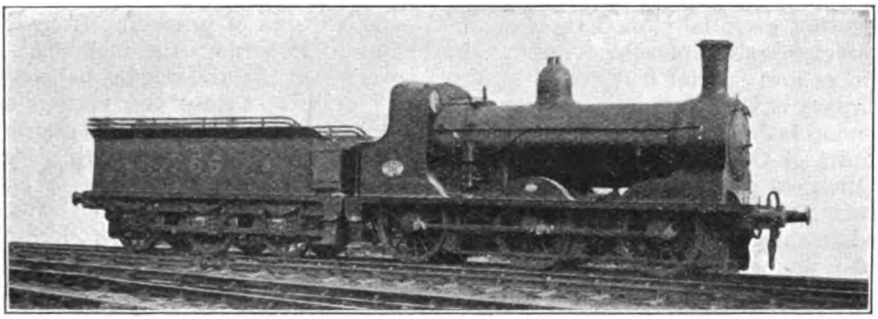
REBUILT GOODS LOCOMOTIVES,

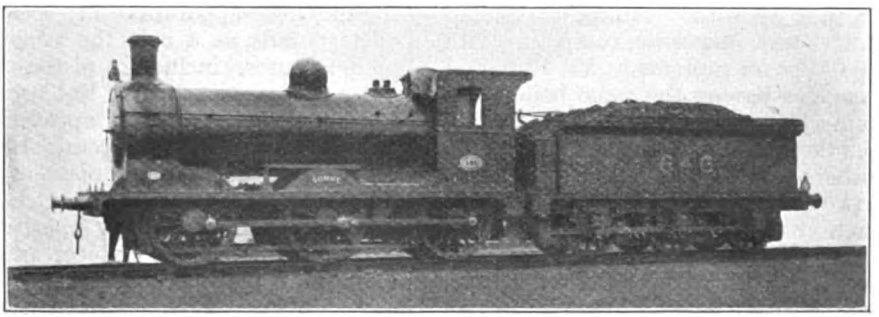
LONDON AND NORTH EASTERN RAILWAY (NORTH BRITISH SECTION).

Mr. W. CHALMERS, Mechanical Engineer.



AS ORIGINALLY INTRODUCED BY MR. M. HOLMES.

	As built.	*As rebuilt.*
Cylinders	18 in. × 26 in. ..	18 in. × 26 in.
Coupled wheels, diam.	5 ft.	5 ft.
Wheelbase, engine	15 ft. 6 in.	15 ft. 6 in.
Heating surface—		
Firebox	104·72 sq. ft. ..	95 sq. ft.
Tubes	1,130·41 sq. ft. ..	1,214 sq. ft.
Total	1,235·13 sq. ft.	1,309 sq. ft.
Grate area	17 sq. ft.	16·6 sq. ft.
Boiler pressure	150 lb. per sq. in. ..	160 lb. per sq. in.
Weight of engine and tender ..	72 tons	75 tons 8 cwt. 3 qrs.



AS REBUILT BY MR. W. CHALMERS.

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Retirement of Mr. J. G. Robinson, C.B.E.,

CHIEF MECHANICAL ENGINEER, GREAT CENTRAL RAILWAY, 1902-23.

As one of the outstanding personalities of the locomotive engineering world, associated with designs which, both from the technical and the operating aspects, are regarded as representing essentially modern and efficient practice, and responsible for numerous appliances and special features of equipment, many of which are now incorporated in locomotive design extending far beyond the limits of the Great Central Railway, the retirement of Mr. J. G. Robinson calls for special attention. Mr. Robinson was trained on the Great Western Railway; in 1884 he was appointed Assistant Locomotive Superintendent of the Waterford, Limerick and Western Railway (now part of the Great Southern and Western Railway, Ireland), becoming chief of the department in 1888; in 1900 he went to Gorton as Locomotive Engineer, Great Central Railway, taking over the Carriage and Wagon Departments also in 1902 as Chief Mechanical Engineer.

In all his locomotives for the Great Central Railway Mr. Robinson has paid special attention to symmetry of outline and "cab comfort" for the enginemen, though these aspects have never been allowed to interfere with design from the practical standpoint, and the need for obtaining the best results possible from given proportions and equipment.

At a time when the "Atlantic" type of locomotive was, in a sense, competing with the 4-6-0 type for supremacy, Mr. Robinson built engines having the same boiler, size of cylinder and other features, and differing only in the fact that some had the 4-4-2 and others the 4-6-0 wheel arrangement. Both proved excellent in their way, and although the building of "Atlantics" ceased in due course, and later designs for the heaviest work were of the 4-6-0 type, always increasing as time went on in size and power, the "Atlantics" are still being usefully worked on the main line, and are even now to be found on some of the fast, heavy expresses running between London and the North, and *vice versa*.

The first 3-cylinder high-pressure engines in this country were designed by Mr. Robinson for the Concentration Yard at Wath, where the conditions called for powerful tank engines of the 8-coupled type, capable of propelling train loads of 80 coal wagons up the incline at a slow speed, to enable the wagons to be detached and gravitated into the various sidings. The 3-cylinder engines, with cranks set at 120 deg., were adopted with very great success.

Similarly, when attention was being focussed on multi-cylinder locomotives, and interest in three-cylinder compounds was being revived, Mr. Robinson tried a system that had proved successful on another railway, applying it to several "Atlantic" engines. Subsequent to these there commenced under his direction the era of the "big" locomotive on the Great Central Railway, and he successively turned out at the Gorton shops very powerful main line and tank locomotives for goods, mineral and passenger train working, each one as it appeared being a considerable advance upon its predecessors.

In 1911 he turned his attention to the development of superheating apparatus and the widespread use of the apparatus bearing his name is the most striking testimony to its efficacy that could possibly have been awarded. The use of superheating apparatus in locomotive boilers entails as a rule the adoption of other features, including piston valves, release valves, &c., and Mr. Robinson early gave his attention to the improvement of these details of equipment. He also devoted himself to the subject of forced lubrication, producing the "Intensifore" lubricator. Mr. Robinson similarly identified himself with the subject of superheating for marine boilers, and several large shipping companies have fitted the "Robinson" superheater. His other inventions include apparatus for preparing and utilising pulverised fuel, colloidal fuel mixtures, &c., in locomotive fireboxes, and, apart from devices centred in the locomo-

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tive itself, he introduced the train-control system referred to as the "Reliostop," and, in addition, the anti-collision, &c., fittings for passenger rolling-stock.

Photographs of 15 of the more important locomotive designs introduced by Mr. Robinson are illustrated as frontispiece, as follows;

Illus. No.	Type of engine.	Year first built.
1	4–4–2 (2-cyl.)	1903
2	4–4–2 (3-cyl.)	1906
3	4–6–0	1906
4	2–8–0	1911
5	4–6–0	1912
6	4–4–0	1913
7	4–6–0 (4-cyl.)	1917
8	4–6–0 (4-cyl.)	1920
9	2–8–0	1918
10	2–8–0	1918
11	4–4–0	1919
12	4–6–0 (4-cyl.)	1921
13	0–8–4 (3-cyl.)	1907
14	2–6–4	1914
15	4–6–2	1911

MR. J. G. ROBINSON, C.B.E.,
Chief Mechanical Engineer, Great Central Railway, 1902–23.

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VIEW OUTSIDE WEMBLEY PARK STATION, METROPOLITAN RAILWAY, SHOWING NEW STATION BUILDINGS, &c.

"Cup Final" Traffic at Wembley, April 28, 1923.

IT is hardly claiming too much to regard the work of the railways in serving Wembley on Saturday, April 28, 1923, on the occasion of the English "Cup Final," as one of the greatest transport feats ever achieved. As arranged it would have been a remarkable undertaking; the outcome was a transport feat which probably those who carried it out would hardly have regarded as within the bounds of possibility—with "hardly a scratch" to any passenger, and certainly without injury to life or limb due to transport conditions. The railways had provided services which, it was anticipated, would meet all requirements, avoid congestion, and reduce overcrowding and discomfort to a minimum. In practice, they carried about double the numbers of passengers expected, commenced return services before the outward pressure had ceased, improvised train services practically on the spur of the moment, and called upon their staffs to give up rest and "breathing space" periods, a call which was willingly and freely answered. Under the circumstances, some overcrowding was inevitable, but such delays as there were may be attributed not so much to the crushes at Wembley, as to the cumulative effects of difficulties in detraining and entraining the tremendous crowds, and in dealing with trains at times when "breathing spaces" were anticipated and when other traffic also required attention. Had it been possible to load and unload trains without delay, and to keep the disappointed returning crowds from congesting the dispersal of arriving passengers, there is little doubt that every passenger would have been able to return with no greater discomfort, if any at all, than that experienced on the outward journey. It was, indeed, a wonderful achievement, creditable to officers and staff concerned, of all grades, and on every duty.

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Long-Distance Traffic.

The following numbers of special trains were run, according to official information.

London Midland & Scottish—		
To Euston	49	
„ St. Pancras	20	
	—	69
London & North Eastern—		
To King's Cross	20	
„ Marylebone	19	
„ Liverpool Street	4	
	—	43
Great Western—		
To Paddington		24
Southern—		
To Victoria, L.B. & S.C. Section	4	
„ Waterloo, L. & S.W. „ ...	1	
„ London, S.E. & C. „ ...	1	
	—	6
Metropolitan—		
To Wembley Park		3
		145

Long-distance traffic began to arrive at Euston and St. Pancras by special trains commencing at 3 a.m. The 69 specials included about 450 saloons, which, together with considerable numbers of ordinary main line vehicles, were chartered by special parties, and it is estimated that between 25,000 and 28,000 passengers were thus brought to London from the provinces, apart from those travelling by ordinary trains. The empty stock was mainly stabled in sidings in the Willesden district. Nearly all these trains consisted of at least 12 main line vehicles, a considerable number, particularly of saloon car types, coming from the Lancashire and Yorkshire section. For the reception of these trains the sidings in question were all cleared of coal and other traffic in good time. Between 12 noon and 2 p.m. several main line trains were booked to call specially at Wembley, including the principal morning expresses from Liverpool and Manchester, one or two Birmingham trains, and the through train from Ramsgate Harbour to the North. The return trains were booked to leave Euston between 9 p.m. Saturday and 3.10 a.m. on Sunday. The whole of this traffic worked almost exactly to schedule, passengers being unanimous in their approval of the arrangements made and the good time kept, whatever may have been their views as to conditions at Wembley.

Similarly in regard to the London and North Eastern early morning specials to Marylebone, together with those at other termini and the night return services. These, though fully loaded, and including large numbers of saloon and reserved carriage parties, worked easily, almost exactly as scheduled, passengers travelling in comfort in both directions. With regard to London and North Eastern main line traffic prior to and after the match, this was chiefly dealt with at Wembley Hill station. Six long-distance trains were booked to arrive after 1 p.m. These arrived almost exactly on time, and, although they brought considerable numbers of passengers, were dealt with quite conveniently. At this station, to meet the anticipated needs of the traffic, up and down platforms had been lengthened to 508 ft. and 535 ft. respectively, and a new approach, available also as an exit, had been provided to the up platform, while a new concrete footbridge, 12 ft. in width, across the station and a new roadway, 15 ft. wide, had been constructed to facilitate the flow of traffic. Before the match no special trains from London were dealt with here, all this traffic being handled at the new Exhibition station. Owing, however, to the fact that a number of long-distance passengers would be breaking their journey at Wembley, though holding tickets which would take them to London, five trains were scheduled to leave Wembley Hill station for Marylebone after the match was over, and two or three of these had to be brought into use for conveying passengers back very soon after 3 p.m. This was an unexpected development, and as a large number of passengers presented themselves at Wembley Hill instead of the Exhibition station, stock had to be utilised for their conveyance that was really needed for later service.

Metropolitan Railway Services.

Although the Metropolitan Railway was not directly concerned with long-distance traffic, large numbers of passengers, particularly those arriving at termini other than Marylebone and Euston, used this route to Wembley Park, while its connections with the "Underground" system as a whole caused the Metropolitan route to be in special favour. Commencing at 11.30 a.m., an "intense" service of trains to and from Wembley Park had been arranged, a large proportion being non-stop or calling once or twice on the journey,

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PASSENGERS ARRIVING AT THE NEW PLATFORMS, METROPOLITAN RAILWAY STATION.

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thus enabling the four-track facilities, available from Finchley Road onwards, to be fully utilised. Between 11.30 a.m. and 12 noon 13 trains for Wembley Park were scheduled to leave Baker Street, 26 between 12 noon and 1 p.m., and 23 between 1 and 2 p.m., these being necessarily additional to those required to meet the needs of season-ticket travel to stations on the route. Trains for stations beyond Harrow were usually scheduled to pass Wembley Park without stopping, so as to free them from the special traffic. Thirty-eight trains, each consisting of seven or eight vehicles, were in service, and when the full pressure of traffic came along most of these conveyed nearly, if not quite, 1,000 passengers.

An important factor conducing to the smoothness with which traffic was dealt with at Wembley Park was the provision of a new double-sided platform on the up side, giving two faces 440 ft. in length, and reached by a 20 ft. stairway leading to exits on the opposite side of the road bridge to the old station. The latter had also been improved, and the booking hall almost entirely rebuilt, so that, in conjunction with booking facilities across the road to serve the new platforms, no fewer than 19 booking windows were available. To expedite train movements, the signalling between Baker Street and Wembley Park had been amplified, 17 new sections being formed. These arrangements proved entirely effective in the down direction, train after train conveying its load of passengers for Wembley Park with hardly any delay, detraining at Wembley Park proceeding quite smoothly and without congestion. The fact that three platforms were available at Wembley Park materially assisted the rapid dispersal of passengers, though it was noted that, on more than one occasion, the last passenger had left a platform within 1½ min. of the arrival of a fully-loaded train.

Arrangements for the return traffic provided for 26 trains towards London between 4 and 5 p.m., 36 between 5 and 6 p.m., and 35 between 6 and 7 p.m. Actually, return services had to be commenced soon after 2 p.m., and a frequent service was therefore run continuously from that time, instead of the ordinary service scheduled between 3 and 5 p.m. It is estimated that 68,000 passengers were conveyed by the Metropolitan route to Wembley in the down direction, and that 84,000 returned, the latter including passengers utilising the inter-availability of the standard London–Wembley return ticket, as arranged between the railways concerned, or booking specially. Apart from the special London–Wembley service, the Metropolitan Railway ran three special steam trains to Wembley Park, two from Aylesbury and one from Chesham, these being timed to reach Wembley at 1.35, 1.38 and 1.57 p.m., respectively.

Except that a degree of overcrowding was inevitable under the circumstances, the Metropolitan Railway services worked without the slightest hitch, notwithstanding the departure from scheduled arrangements. Conditions at Baker Street were materially assisted by the provision of additional entrances and exits and booking facilities. During the peak period passengers were handled at Wembley Park station at the rate of about 1,000 per minute, the general average being about 30,000 per hour.

London and North Eastern Railway.

To provide for the Stadium traffic, a circular loop line, approximately one mile in length, had been built, diverging from the down main line between Neasden Junction and Wembley Hill, joining the up line at Neasden North Junction, both connections being under the control of the latter signal cabin. Work on the construction of this loop was commenced in December last, involving the removal of some 30,000 to 40,000 cubic yards of clay, the station itself being approached through a deep cutting. The platform is 600 ft. long and 22 ft. 6 in. wide. To facilitate traffic working, automatic signalling had been installed between Marylebone and Wembley Hill stations, also round the loop, while, in view of the anticipated need for a three-minute service, five automatic and three semi-automatic down signals, together with four automatic and three semi-automatic up signals between Marylebone and Wembley Hill (two block cabins have been dispensed with), were installed. On the loop there were three automatic signals, two in rear of the station and the third as starting signal. These signals are of colour light type, several of them, for

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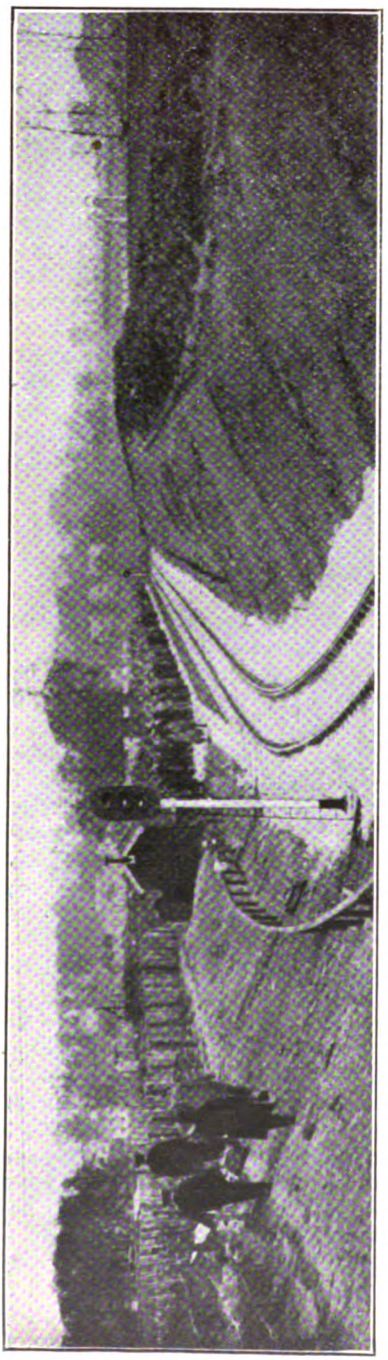
the first time in British practice, being three-position, indicated, respectively, by red, yellow and green lights. Alternating current track circuits are employed in view of the proximity of the Metropolitan Railway tracks. Experience has shown that these colour light signals can be seen quite clearly under all climatic conditions, while in hazy weather and at night they may be clearer than the ordinary signals. Nineteen of these colour light signals are in use, nine being of the "Hall" type and the remainder made by the Westinghouse Brake and Saxby Signal Company. The "Hall" type colour light signals, and the electric lever locks, which are of the Great Central Section's standard pattern, were supplied by the General Electric Company, Limited, and the British Power Railway Signal Company, respectively. The "Reliostop" System of Automatic Train Control, which was in use on this section of the line when mechanically signalled, has been retained and re-arranged to suit the automatic working. Track-circuiting has also been extended to cover the main running lines controlled from two boxes at Marylebone, two at Neasden and from Wembley Hill station box. At the Marylebone goods yard and Neasden South and North Junction signal boxes, illuminated diagrams controlled by the track circuits have been provided, and at these cabins track-block working is now in operation. The whole of the signallling work was carried out by the Westinghouse Brake and Saxby Signal Company, Limited, of 82, York Road, King's Cross, London, N.1, with the exception of the mains and line wires, which were provided by the company's electrical department. The alterations to the mechanical signalling were carried out by the railway company's staff.



THE NEW EXHIBITION STATION, LONDON AND NORTH EASTERN RAILWAY, SHOWING DAYLIGHT COLOUR-LIGHT SIGNALS AND PLATFORM THRONGED WITH PASSENGERS WAITING FOR RETURN TRAINS.

The special service between Marylebone and the Exhibition station provided for 51 booked trains, of which 15 were scheduled between 1 and 2 p.m. and nine between 2 and 2.30 p.m. Most of these trains, made up of eight bogie vehicles, from about 11 a.m. conveyed maximum train loads to Wembley. At Marylebone, platforms Nos. 3 and 4 were allocated exclusively to football traffic. At the Exhibition station eight double gates provided 16 exits to a road leading directly to the Stadium, and it was found practicable to unload and dispose of a train load of between 800 and 1,000 passengers in about one minute. In fact, in the down direction, this service worked splendidly.

The return service scheduled provided for trains every three minutes, and no

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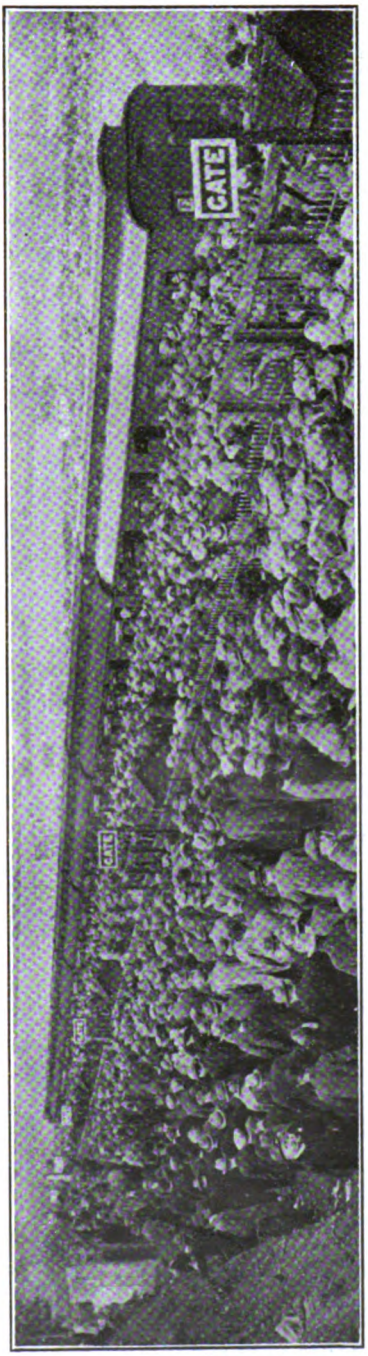
doubt this would have been worked with the same smoothness if the booked arrangements could have been adhered to. In practice, however, these went by the board owing to the density of the crowd and the fact that, as it was impossible for so many thousands to get into the Stadium and many were anxious to return home, a service was provided from, approximately, 2.30 p.m. and continued without cessation until the last of the spectators had left. Soon after 2 o'clock it became apparent that many would-be spectators were desirous of returning to London, and loaded trains arriving were promptly re-loaded and despatched. As, however, many of the trains had proceeded to Neasden Sidings, there to be stabled until required for working after the match, it became necessary for them to be called into service to meet the needs. The early return trains worked back on their improvised timings with reasonable smoothness, having regard to the extremely difficult conditions, these being accentuated by the fact that necessary work in the Marylebone area, planned for the "breathing space," had to be performed as and when possible. Later, when the bulk of the traffic presented itself, and while the trains were got away from the Exhibition station smartly, many of them sustained a certain amount of delay on the journey Londonwards. There were two very good reasons to account for this; one, that congestion naturally resulted from the wholesale dislocation of booked arrangements; and another, that, as the return trains had to run very much later than was anticipated owing to the late finish of the match, many of the trains approached Marylebone when long-distance and other important trains were arriving. In the circumstances, it must be held that all concerned worked very hard under extremely difficult conditions, and that the traffic was handled in an efficient manner.

London Midland and Scottish Railway Services.

A large proportion of the London–Wembley traffic was conveyed by a 10-minute service of non-stop steam trains between Euston and Wembley; increased electric trains between Broad Street and Wembley; and the "Bakerloo" through electric trains. In connection, special trains were run between Barking, on the Tilbury section of the Midland Division, and Broad Street, enabling passengers to transfer to the Broad Street–Wembley trains at Dalston Junction, together with two direct



SCENE AT THE NEW EXHIBITION STATION, LONDON AND NORTH EASTERN RAILWAY, SHOWING ENTRANCES AND EXITS.

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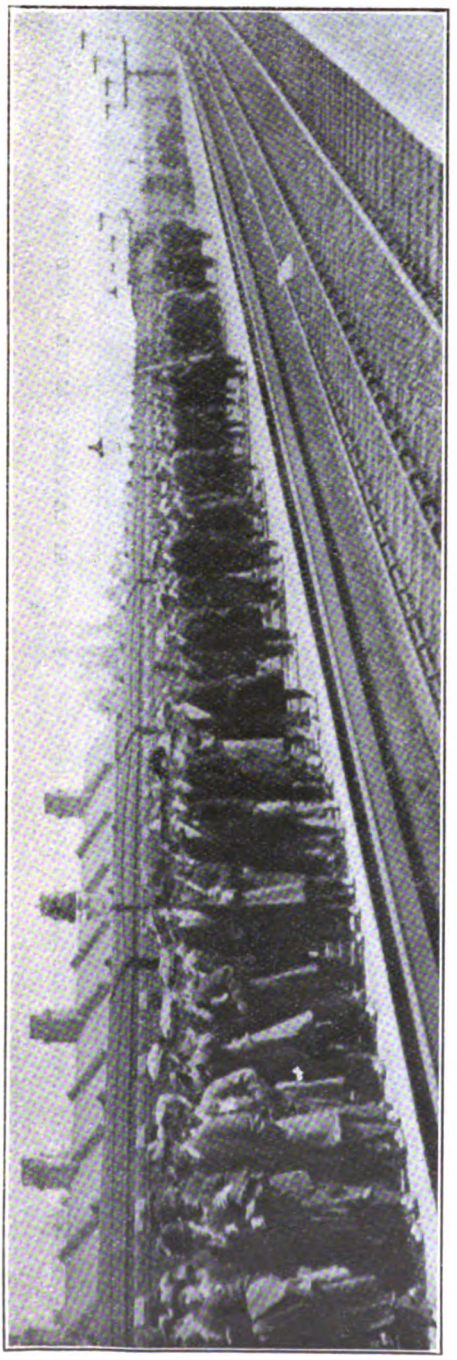
from Barking to Wembley; also from Clapham Junction to Willesden Junction, together with an increased service between Earl's Court and Willesden Junction.

Five sets of vehicles were used for the Euston–Wembley steam service, departing alternately from platforms Nos. 6 and 9 at Euston, travelling slow line throughout, thus keeping this traffic quite independent from that on the electric routes. Ordinary traffic not concerned with Wembley was, as far as possible, concentrated upon the fast lines. Altogether 16 trains were booked to arrive at Wembley between 11 a.m. and 12 noon. Between 12 noon and 1 p.m., 17 trains were scheduled; between 1 and 2 p.m., 21; and between 2 and 3 p.m., 18; apart from main line trains calling specially. In practice, these services worked almost exactly to schedule until between 1 and 2 p.m., when the tremendous numbers of passengers presenting themselves—these numbers being unprecedented and entirely beyond the bounds of anticipation—began to cause delays in entraining and detraining, particularly in regard to the electric trains from the "Bakerloo" line, and from Euston and Broad Street, this reacting back upon the tube railways in connection. The cumulative effect of this was also attributable to the fact that before 2 p.m. people were assembling at Wembley desiring to return to London, so that the opposing crowds prevented the platforms being cleared sufficiently quickly and the trains got away to avoid delaying trains behind, thus adding to the difficulty.



PASSENGERS ARRIVING BY STEAM TRAIN FROM EUSTON, LONDON MIDLAND AND SCOTTISH RAILWAY.

Return special trains for Euston were scheduled to leave Wembley, commencing at 5 p.m., at 5-minute intervals, together with augmented electric services and connecting trains from Willesden Junction to Clapham Junction and Earl's Court and from Wembley and Broad Street and Dalston Junction to Barking. In addition, it was arranged that several long-distance expresses from Euston, including the 6.5 p.m. Manchester, should call specially at Wembley. Actually, most of these arrangements had to go by the board, the Euston–Wembley steam service being continued practically without intermission, so as to bring disappointed passengers back, this traffic commencing long before the arriving pressure had ceased; similarly on the electric side. London Midland and Scottish electric trains were run on from Wembley to Harrow, where a reversing siding had been put in, and returned at once in a continuous series, running to

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Broad Street and Euston, ordinary traffic for stations between Wembley and Watford being left entirely to the joint stock "Bakerloo" line trains. The augmented services were therefore run practically continuously from 9 a.m. until 7.30 p.m. To meet the exceptional demands, in addition to the five steam sets scheduled for the Euston–Wembley service, five Watford sets were brought into service, and to ease the pressure, these trains were at a later stage booked to call additionally at Willesden, in order to take passengers for Broad Street and other routes accessible there, so as to relieve the direct Broad Street and Euston electric and "Bakerloo" service. Two trains were run through to Barking from Wembley, and, instead of the scheduled service from Broad Street to Poplar, the trains between Broad Street and Poplar were run through to Barking, a shuttle train working between Bow and Poplar to maintain that connection.

An important feature at Wembley was the provision of a separate entrance adjacent to the goods yard approach, leading direct to the up slow line platform. Special booking offices were erected about half-way along the new path, so that it was possible to regulate the pressure of traffic, first at the entrance gates and then by sliding doors controlling actual entrance to the platform. This arrangement, particularly when the Willesden stop commenced to be made by the through Euston trains, assisted materially to relieve the pressure which otherwise tended to impose a severe tax upon the approaches leading to the platforms used by electric trains.

As far as can be ascertained, though collective figures can hardly be given owing to the fact that passengers arrived from so many directions, a large proportion having through tickets of one kind or another, about 11,000 passengers were booked from Euston and 8,000 from Broad Street, the London Midland and Scottish Railway altogether booking some 75,000 passengers, the majority with return tickets and therefore making two journeys. To avoid congestion on the arrival of trains, Wembley tickets issued by the Euston through trains were collected at the barriers at Euston, so that passengers arriving at Wembley could disperse at once.

Other Services.

As the most distant of the stations available for Cup Final traffic, Sudbury Town, Metropolitan District Railway, was not used by very large numbers of passengers,

DISAPPOINTED SPECTATORS WAITING AT WEMBLEY, LONDON MIDLAND AND SCOTTISH RAILWAY, FOR RETURN TRAINS.

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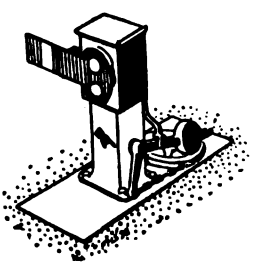
SCENE AT WEMBLEY HILL STATION, LONDON AND NORTH EASTERN RAILWAY.

though several thousands travelled by this route, being conveyed by L.G.O.C. omnibuses to and from the Stadium entrance. The trains on this route were strengthened and a frequent service run, and considerable numbers of passengers came back this way to avoid the crowds assembled at the other stations. In addition to running a continuous service of omnibuses between Sudbury Town station and the entrances to the Exhibition grounds, the London General Omnibus Company extended ordinary services numbered 11, 15, 16, 53, 68 and 68A to Wembley, some 700 vehicles being engaged.. Arrangements were directed by a controller at Wembley, who was in communication with the principal traffic centres on the "Underground" system. The Metropolitan Electric Tramways also operated tramway services from Paddington, Acton and Scrub's Lane to Wembley. All these services carried many thousands of passengers. Bookings on the "Underground" railways were 133,530 in excess of a normal Saturday's traffic.

In conclusion, it may, we think, fittingly be said that the railways outdistanced all their previous efforts in the handling of a large volume of traffic within a limited space of time, and, in the extraordinary circumstances prevailing, it must be held that the slight delays occasioned to passengers on the return journey by certain routes were relatively insignificant.



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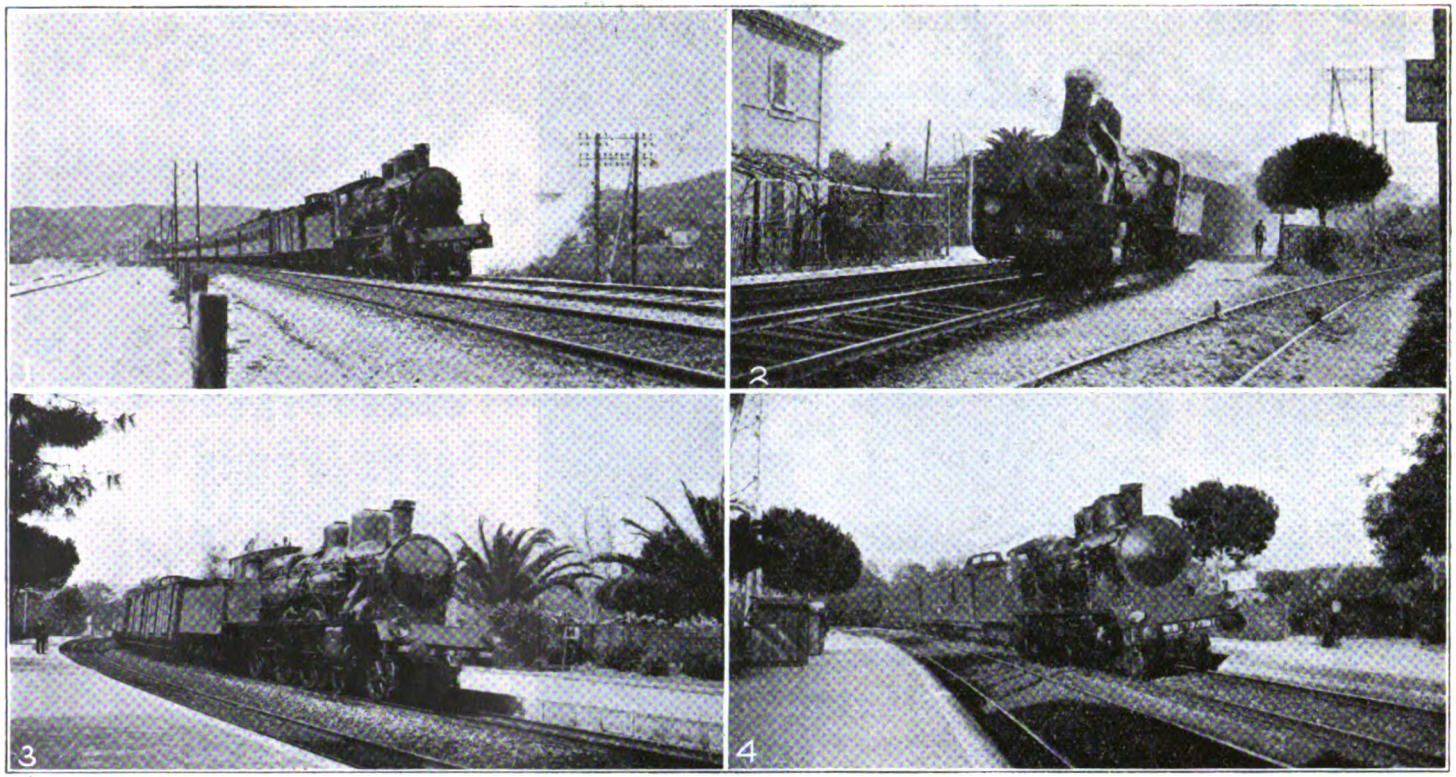
TRAINS ON THE PARIS, LYONS AND MEDITERRANEAN RAILWAY.



1. Calais–Mediterranean Luxe, the "Blue Train." 4-6-0 locomotive, S2595.
2. An East-bound goods train, hauled by an old 8-coupled engine.
3. Paris–Mentone First-class Rapide. 4-6-0 locomotive S2507.
4. The Up "Blue Train," 4-6-0 locomotive, S2439. Note super-elevation of outer rail on curve.

Photographed by E. A. Gurney-Smith at Juan-les-Pins.

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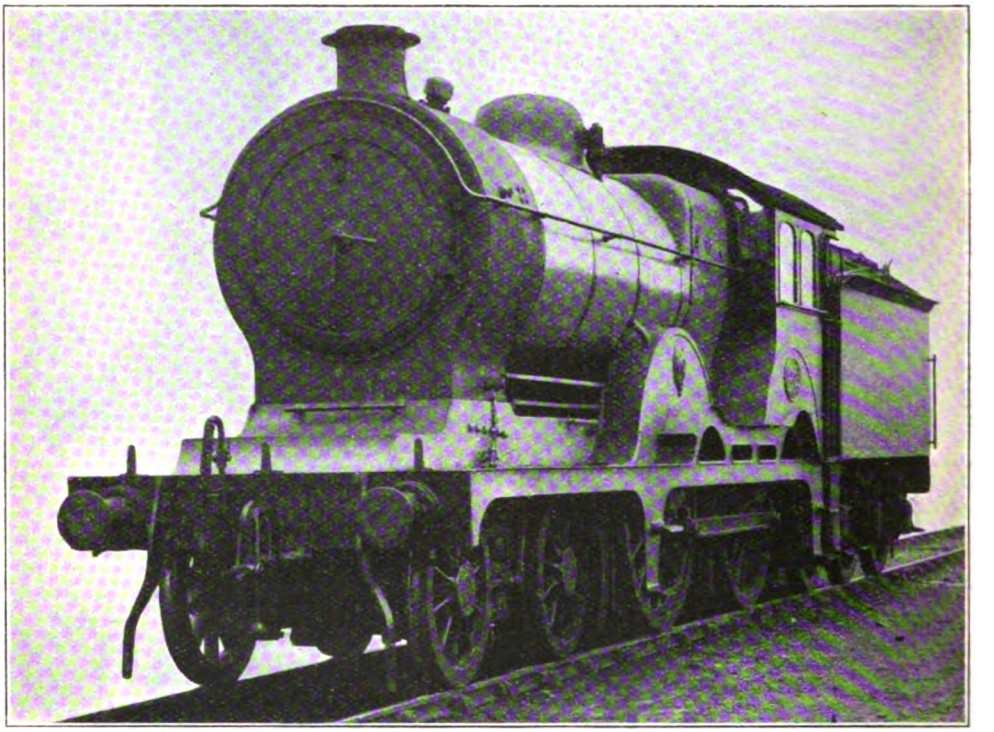
REBUILT 4-4-0 LOCOMOTIVE, GREAT EASTERN SECTION, LONDON AND NORTH EASTERN RAILWAY.



BY courtesy of Mr. C. W. L. Glaze, O.B.E., District Mechanical Engineer, Stratford, we are enabled to illustrate Great Eastern 4-4-0 locomotive No. 1805 ("Claud Hamilton" class), as rebuilt with boiler 5 ft. diam. the centre line being pitched 3 in. higher, heating surface and other dimensions being increased accordingly. "Ross" safety valves, top feed and new cab are other features of the "Super-Claud" class. Leading dimensions are: Cylinders, 19 in. by 26 in.; coupled wheels, 7 ft. diam.; steam pressure, 180 lb. per sq. in.; heating surface—ordinary tubes, 1035·2 ft., large tubes, 344·5 sq. ft., firebox 128·2 sq. ft., superheater, 180·5 sq. ft.; grate area, 21·6 sq. ft.; weight of engine in working order, 55 tons 10 cwts.; weight of engine and tender in service condition, 94 tons 15 cwts.

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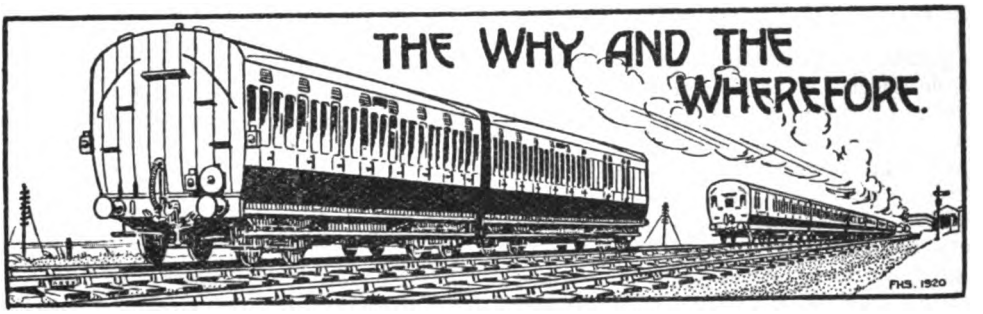

RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition* (1923) *of this standard railway reference work is on sale at* 5*s. net, or by post from the* RAILWAY MAGAZINE *Offices,* 33, *Tothill Street, Westminster, London, S.W.*1, *to any part of the British Isles,* 5*s.* 6*d., Overseas,* 5*s.* 8*d.*

2-6-2 Tank Engines, London Midland and Scottish Railway.

In further reply Mr. R. H. Coe writes—"Since their removal from the Manchester-Oldham line a few years back these locomotives have been used for shunting and banking purposes, mainly in the Bury and Accrington districts. Since the early part of last summer, however, they have been standing idle in the various sheds at which they are stationed. Several can be seen outside Bury shed in a very woebegone condition. A little while back they were all condemned, but it is now rumoured that the survivors are to be repaired and put to work on the Shap incline of the London and North Western Section." Mr. J. Bond mentions that these engines are principally at Bury and Wigan sheds, and are now chiefly used for banking and local goods and shunting duties. "Werneth Bank" points out that the branch line from Werneth to Manchester, *via* Hollinwood, rises from the latter station for approximately half a mile at 1 in 84, and finishes the remainder, about 1¼ miles, at 1 in 50, including a very short radius curve approaching the junction with the 1 in 27 bank. He suggests that the real trouble with these engines was that they were too rigid for this curve. He mentions that, in view of the contemplated electrification of the Oldham branch, this curve is being eased.

[Further reply to L. G. J.]

London and North Eastern (North Eastern) Darlington-Newcastle Section.

Gradients of this section are not exceptionally severe, the worst being 2¼ miles up at 1 in 203 past Bradbury; 1¼ down to and 1¼ up from Croxdale Viaduct, both at 1 in 150; a mile at 1 in 163 up to Relly Mill Junction with ¾-mile down immediately following at 1 in 107–120 past Durham; 3 miles down at 1 in 150 to Chester-le-Street, with a further 3, mostly at 1 in 150–231 past Birtley, and a gentle rise into Newcastle. This is mostly in favour of down trains, the up journey being considerably the harder, especially as regards the severe slack through Durham, with a recovery up 1 in 107. The very ample time allowances over this section are to allow for constantly recurring trouble with colliery subsidences (similar to that experienced on the Midland between Trent and Chesterfield); there are times, as at present (only one severe "caution" is now in force, at Lamesley), when the allowance is doubtless excessive, but for the sake of punctuality in running it is deemed advisable to cover the imposition of special slacks whenever necessary.

[Reply to "MEDICO."]

"Group" Engine Workings.

In view of the number of railways incorporated in the larger groups, readers must accustom themselves to seeing locomotives and coaches in hitherto unusual

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localities. Before many months are past, whole issues of this magazine would be required if we were to attempt to set out the exchanges and inter-workings of rolling-stock that are certain to take place; thus we fear we cannot undertake to answer further queries of this character. We note, however, that late Furness Railway engines are working through to Preston, that a late North London engine has been seen shunting at Carnforth, and that an express on the Midland section of the London Midland and Scottish Railway has been observed leaving Sheffield in charge of the late North Western Railway 4-4-2 tank engine No. 8. Very many similar occurrences might be quoted.

[Reply to "CUMBRIAN," R. HALKETT, and others.]

The Hastings Car Train.

This train, consisting of drawing-room cars, ran for a number of years before the war, but has not been reinstated. The vehicles composing it have, we believe, been reconstructed as Pullman cars. The corridor saloon carriage you have noted standing at Victoria is, no doubt, kept there for use when required for the conveyance of special parties. We have no information as to why the steam rail motor-cars have been withdrawn on the South Eastern and Chatham section of the Southern Railway, but note that they have been replaced by short trains, thus according with a policy which is, apparently, being adopted on many lines where such vehicles were previously employed. Your kind remarks in regard to the RAILWAY MAGAZINE are appreciated.

[Reply to "SOUTH EASTERN."]

Appearance of Locomotives.

Apparently, the brightness suggesting a lighter green in the case of Great Western locomotives, as painted before the war, was partly due to a more elaborate lining out than usual. We agree that a bright and smart appearance, both of locomotives and vehicles, is a good advertising asset for a railway company. Obviously, polished brass domes and numbers of copper-topped chimneys add considerably to the work required at the running sheds to keep them presentable, and this is a principal reason why various railways now paint these parts of their engines. When painted, cleaning is a relatively simple operation. Your complimentary remarks in reference to the RAILWAY MAGAZINE are noted with thanks.

[Reply to J. C. DREW.]

Goods Van Lettering.

We are advised by Mr. C. R. Byrom, General Superintendent (Passenger Commercial), London Midland and Scottish Railway, that the vehicles you noted at Bromsgrove, Midland Division, London Midland and Scottish Railway, were designed for banana traffic, the letters B.X.S. having the following significations: B=Banana Van; X=Fitted with automatic vacuum brake; and S=Fitted with steam heating pipes, in order to enable a certain temperature to be maintained during transit in cold weather. The circle shown in your sketch has now no significance. You are under a misapprehension as to any suggestion that 0-10-0 banking engine No. 2290 is only worked two days per week.

[Reply to E. B. SOWRY.]

South Eastern and Chatham Railway.

Several books have been published giving histories of the South Eastern and London, Chatham and Dover Railways, including those by Mr. G. A. Sekon, a section of Mr. W. J. Gordon's "Our Home Railways," and Mr. E. P. Pattinson's "British Railways," while the subject has received attention in numerous books dealing with British railways as a whole. None of these publications are, however, now available, most of them having long since gone out of print. If you can refer to early volumes of the RAILWAY MAGAZINE or of the RAILWAY YEAR BOOK, most of the information can thus be obtained.

[Reply to J. S. ROPER.]

Non-Stop Runs on Late London and North Western Railway.

Immediately prior to the war, the non-stop allowance for the 209·1 miles from Euston to Rhyl was 238 min.; Euston–Stockport was only run without a stop in the earliest years of the 3½-hour Manchester expresses, which, after the opening of the Styal route, were transferred to the latter, and stopped at Wilmslow, 176·9 miles from Euston, in 191 min. from the start. The latter run has now been reverted to in the case of the 6.5 p.m. *ex-*

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Euston, and the 9.45 a.m. *ex*-Manchester, except that the latter now runs up from Wilmslow in 187 min.

[Reply to J. O. RYMER.]

Dynamometer Car on Southend Line, London Midland and Scottish Railway.

Presumably, dynamometer tests are being made on this section, for which purpose the late Lancashire and Yorkshire dynamometer car has been used, but we have no information as to whether the results will be made public. Such tests are often made for departmental purposes, and only occasionally are they published. We note your remarks as to re-lettering of goods wagons and brake vans on the Tilbury section of the late Midland Railway, and that some of the 4-4-2 tank engines are being fitted with extended smoke-boxes.

[Reply to R.O.D.]

Southern Railway Bridges.

Information is not available as to whether the bridge repairs in progress between Victoria and Bickley, South Eastern and Chatham section, are designed to permit of the large 4–4–0 locomotives working to and from Victoria, or whether they are merely the ordinary repairs and reconstruction work, necessarily continually in progress. There is only one 2–6–4 tank engine at present in service. Mr. Allen will, of course, again deal before long with locomotive performance on the South Eastern and Chatham section of the Southern Railway.

[Reply to N. S. J.]

Tank Engine Express Trains.

The fact that a Great Western Railway 4–4–2 tank engine is scheduled to run the 5.22 p.m. from Reading to Paddington in 40 minutes for the 36 miles certainly indicates good running, though it must be associated with express runs by tank engines such as those made on the late London and North Western and London, Brighton and South Coast and other railways. Some of these may not quite reach the same average speed, but they are of greater length and over a harder route.

[Reply to " COUNTY TANK."]

London and North Eastern Railway Locomotives.

Apparently, the policy adopted on this system is that of retaining the old numbers of engines, differentiating those belonging to the respective sections by the use of the name of the locomotive headquarters, Gorton, Stratford, &c. Consequently, although engines may be re-painted and re-lettered, they are not, speaking generally, being re-numbered. All the Great Central 4-6-2 tank engines are superheated. There are no 4-6-2 tender engines on this section.

[Reply to " INCOGNITUS."]

Numeral Head Codes.

We understand that a trial is being made on the Great Eastern section of the London and North Eastern Railway of a system of head codes, including the use of a large head lamp indicator bearing a numeral which can be illuminated at night, with a view to ascertaining whether the system is a practicable one for indicating the routes and destinations of suburban trains, as an alternative to the present combinations of green and white lights. Whether the system will be adopted generally remains to be seen.

[Reply to D.P.S.]

E.F.B. and L.V.

At Victoria (London, Brighton and South Coast) station the letters " E.F.B." are shown at places where electric fouling bars are provided on the track to protect the positions where light engines or vehicles may stand, their presence being electrically safeguarded. On the London, Brighton and South Coast section of the Southern Railway the end of every train is indicated by a red board bearing the letters " L.V." —last vehicle.

[Reply to C. D. ATKINSON and T. D. CARNWATH.]

" Cosmopolitan " Railway Stations.

It should have been made clear in the previous reply that the point in question was not entirely that of whether three or four of the new railways used the same station, the application being more particularly that they served the same place. Hence your comment that at Aylesbury the London Midland and Scottish Railway had a separate station applies only according to the strict interpretation of what was said in the May number.

[Reply to A. R. ELLIOTT and OTHERS.]

Double Regulator Handles.

From your description we imagine you refer to duplicate regulator handles, on

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both sides of the cab, in order to enable the engine to be operated from either side. The arrangement is at times of great convenience, especially when in shunting a driver requires to look out from the opposite side of the engine to that from which he drives normally. This duplicate equipment is now frequently fitted.

[Reply to A. E. FORREST.]

Three-Position Light Signals.

The signals of this class you have noted between Marylebone and Wembley Hill stations were erected partly for trial purposes, but more particularly to divide up the relatively long sections on the route to enable the increased numbers of trains to be worked, required to carry the traffic to Wembley in connection with the Cup Final on Saturday, April 28. Reference is made to them elsewhere in this issue.

[Reply to " SIGNAL."]

Electric Conductor Rails.

Current supply by means of a conductor rail is, apparently, most favoured, except where high voltages are used, as it avoids complicated overhead structures, though at the expense of complex track layout. The recommendations of the Committee to which you refer were, however, based more particularly upon the best method of ensuring uniformity of practice on British railways.

[Reply to K. H. S. MASSEY.]

Coal Tax Monument.

Apparently, the monument noted by you alongside the Brighton-London main line, on top of the rather steep embankment to the north of Merstham tunnel and near Star Bridge signal-box, is one of those erected in early days to indicate the points where, to correspond with toll gates on the main roads adjacent, taxes once imposed on coal entering the London area became operative.

[Reply to J. E. C.]

Southern Railway (" Brighton " Section) " Ironclad " Cars.

This is the nickname usually applied to the heavy converted electric stock which is used on certain main line trains; the name probably arises from the heavy steel truss which stiffens the frame on both sides, and contributes to the distinctive appearance of the coaches. Only two questions are answered in any one issue; see rules.

[Reply to C. THOMPSON.]

London & North Eastern (Great Central) Railway Locomotives.

We cannot give particulars of renumbering and renaming in regard to this or other railways. Presumably the changes you note have been made in order to obtain consecutive numberings for engines of the same class, or to associate engines named on a particular system to form a corresponding numerical series.

[Reply to " MOUNTAINEER."]

Welsh Highland Railway.

Articles describing the Festiniog and North Wales Narrow-gauge Railways appeared in the August, 1900, and July, 1917, numbers of the RAILWAY MAGAZINE. Unfortunately, these issues are now out of print. We hope to deal with the new sections now under construction in due course. Traffic was inaugurated on certain new sections at Whitsuntide.

[Reply to F. H. EYLES.]

Special Stops of Goods Trains.

We are not aware as to the conditions at the particular place you mention, but would assume it is one where the rule is for all goods and mineral trains to come to a dead stand, to ensure that they are under control before descending a steep incline, and frequently to provide for a proportion of the hand-brakes to be pinned down.

[Reply to J. C. DREW.]

New Locomotive Liveries.

Definite information is not yet available as to the style of painting to be adopted on the London Midland and Scottish Railway, though it is of interest to note that, as you say, late London and North Western Railway locomotives are leaving the paint shops in pre-war colours—black, with red and white lining.

[Reply to " PRECURSOR."]

Royal Trains.

Occasionally the last ordinary train preceding a royal special is scheduled as " pilot," its passage governing the rules issued otherwise in regard to the passing of the " pilot " engine. For particulars of names and numbers of London and North Western locomotives see Mr. C.

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Williams's pamphlet, of which particulars appear in advertising pages.

[Reply to R. E. THOMAS.]

Southern (S.E. and C.) Railway Locomotives.

You are correct in pointing out that the weight in working order of three-cylinder 2–6–0 locomotive No. 822 with its tender is 102 tons, and not 115 tons 15 cwt., as stated on the frontispiece to the April RAILWAY MAGAZINE. The correct figures appear in the article in the same issue.

[Reply to J. F.]

London & North Eastern (Great Northern) Railway 0-6-2 Tank Engines.

It is often necessary to make certain detail alterations in the fittings of new engines, as experience indicates the desirability therefor, and this probably explains why alterations have been made in regard to the piston valves of some of the superheater 0–6–2 tank engines.

[Reply to E. L. SMITH.]

Great Eastern Railway Locomotive "Petrolea."

We are not certain as to whether this engine is still in service, but most of the general class to which No. 760 belongs, including those which at one time were oil-burners, have been rebuilt as 4–4–0's. For particulars as to places served by the train mentioned by you, please see time-tables.

[Reply to R. E. MOODY.]

London Midland and Scottish Railway (late Lancashire and Yorkshire Section) Tenders.

Eight-wheeled tenders on this section have a wheelbase of 15 ft. 9 in., and a capacity for 3,600 gallons of water and 6 tons of coal, as against 10 ft. 6 in., 2,290 gallons and 5 tons, in the case of the latest six-wheeled tenders on the same section.

[Reply to R. HOGAN.]

Midland Railway Locomotives.

Most of the modern express passenger engines and some of the main line goods engines on the Midland Division of the London Midland and Scottish Railway are fitted with water pick-up apparatus. We cannot give particulars of engines under construction and corresponding information. Please see rules.

[Reply to G. H.]

The Stratford-upon-Avon and Midland Junction Railway.

For particulars as to the derivation of locomotives and rolling-stock on this line, please see the RAILWAY MAGAZINE for April, 1910, which included an illustrated interview with the late Mr. Russell Willmott, then Traffic Manager and Engineer of this line.

[Reply to N. JACKLING.]

Great Western Railway Locomotives.

The new four-cylinder 4-6-0 locomotives of the "Abbey" class have boilers of the design standard for that class. We have no information as to whether later ones are to have still larger boilers, also as to chimneys and other details.

[Reply to "PRECURSOR TANK" and H.H.]

Coil Springs for Goods Wagons.

A number of wagons thus fitted are in use on various railways, though the ordinary laminated springs are usual. The former give quite good results in practice, though, presumably, the latter are as efficient, and are probably easier to fit and maintain.

[Reply to K. H. S. MASSEY.]

London and North Eastern (North Eastern Section) "Pacific" Engines.

Nos. 2400 and 2401 are now on regular link working between York, Newcastle and Edinburgh, turn-and-turn-about with the "Atlantics." Mr. Cecil J. Allen hopes to describe journeys behind them in an early instalment of his articles.

[Reply to "MEDICO."]

Lights in Locomotive Cabs.

Apparently, the small lamp you noticed in the cab of a Great Eastern locomotive at Liverpool Street station is one provided to illuminate the water-gauge glasses, so that the height of the water in the boiler can be seen, although the cab is otherwise dark.

[Reply to "MIDLANDIAN."]

Great Western Railway Locomotives.

We cannot go into reasons why certain engines of the "Flower" class have had their nameplates removed. This may be merely a temporary measure, or due to their names being required for other engines.

[Reply to "ST. AGATHA."]

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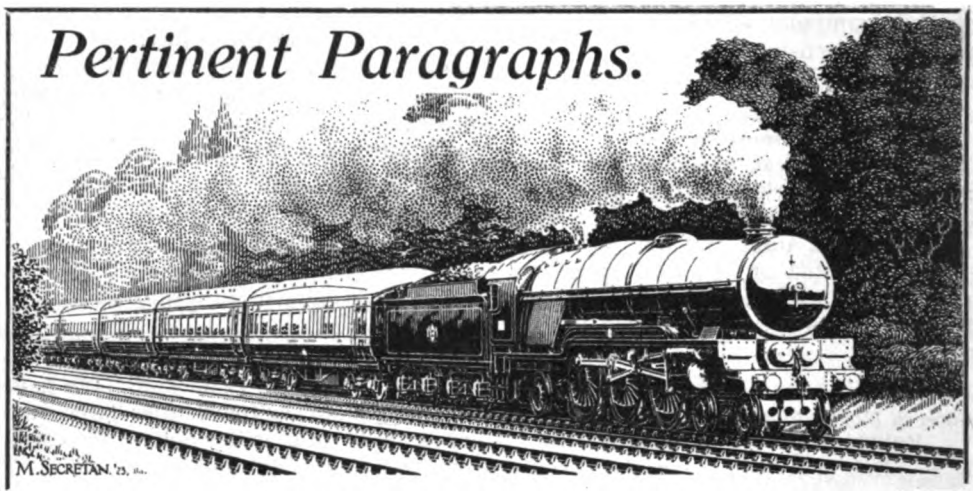
Pertinent Paragraphs.



Closed Carriages.

REFERENCE in the April number of the RAILWAY MAGAZINE to an excursion ticket issued in 1910 being for a "closed carriage" brings to mind the introduction and early use of the vehicles thus described. Until the passing of the Parliamentary Trains Act in 1844, third-class passengers were frequently conveyed in open carriages, *i.e.*, vehicles like a high-sided railway wagon, some being fitted with seats, and others merely divided into four compartments by a longitudinal bar down the centre and a central cross bar. Those without seats were called "stand-ups," which some people have thought was a perversion of "Stanhope"—such carriages having been in use on the Stanhope Railway. The act of 1844 made it compulsory upon railways to convey, by one train a day, passengers in closed carriages with seats, at a penny per mile. All kinds of devices were adopted by some railways to comply with the strict letter of the law, but to make the closed carriages as uncomfortable as possible.

In time it became apparent that third class travellers would not be forced into the higher class coaches by such methods. The consequent growth of third-class traffic coupled with competition between the railways, resulted in third-class passengers receiving better accommodation. The open carriages were then reserved for excursion trains. In course of time the open coaches reached a stage of decay when reparations were no longer desirable; this circumstance coupled with competition between railways for excursion traffic caused the adoption of closed carriages* for excursion trains, the fact that closed or covered carriages were employed being advertised as an advantage in the same manner as, in recent years, the use of corridor stock for excursions has been emphasized in railway advertisements.

The practice of advertising closed carriages for excursion trains persisted long after all open carriages had disappeared. This was due to the method employed in railway offices of copying a previous notice; hence the wording of an excursion bill issued, say, in 1867, was copied for similar excursions in 1868, 1869, 1870 and onwards. We have personal recollections of seeing posters issued by the South Eastern Railway in the 'eighties, advertising excursions from Margate, etc., on which "covered carriages" were mentioned. The competitive London, Chatham and Dover Railway never had possessed open carriages and, therefore, the South Eastern Railway may have considered it desirable to emphasize the fact that its excursions would be equal in accommodation to those of its rival, *i.e.*, would be comprised of "covered carriages."

* "Covered carriage" was the more general appellation.

Wortwell Station.

MR. H. H. MEIK points out in regard to the illustration of this station appearing on page 148 of the February number, and further reference in the April issue, that he has an old Great Eastern time-table, dated March, 1866, showing both Wortwell and Redenhall stations as being in regular use. There were then five trains each way on weekdays between Beccles and Tivetshall, but some of these did not stop at the stations mentioned, and the rest called only to take up or set down. He also mentions another station on this line, appearing in the 1866 time-table, but not shown now either in

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Bradshaw or on the R.C.H. map. This was known as Sharston, and was situated between Harleston and Pulham St. Mary.

"The Lincoln Mail."

WE are indebted to a Derby correspondent for the following notes in regard to this well-known train on the Midland section of the London Midland and Scottish Railway :— This historic train dates back to the days of the old Midland Counties Railway, one of the then "Big Three," which, on amalgamation in 1844, became the Midland proper. By the courtesy of a departmental chief, whose career is in itself one of the romances of the rail, we are enabled to give a few particulars of the history of the Lincoln mail, so far as the records in that gentleman's possession permit.

In January, 1849, a mail train ran from Lincoln to Birmingham as subjoined :—

Lincoln ..	..	dep.	8.30 p.m.
Nottingham	..	,,	10. 0 ,,
Derby ..	..	,,	11.15 ,,
Tamworth	..	,,	12. 3 ,,
Birmingham	..	arr.	1.0 ,,
Birmingham	..	dep.	12.15 a.m.
Tamworth	..	,,	1. 0 ,,
Derby ..	..	,,	2.20 ,,
Nottingham	..	arr.	2.55 ,,
Lincoln ..	..	,,	4.55 ,,

The present service for the Lincoln to Tamworth mail and back is as under :—

Lincoln ..	..	dep.	8.7 p.m.
Nottingham	..	,,	9.11 ,,
Derby ..	..	,,	9.48 ,,
Tamworth	..	arr.	10.29 ,,
Tamworth	..	dep.	2.25 a.m.
Derby ..	..	,,	3.18 ,,
Nottingham	..	arr.	3.50 ,,
Lincoln ..	..	,,	4.51 ,,

The Lincoln-Tamworth mail (8.7 p.m. ex Lincoln) conveys mails and parcels post for Liverpool, all parts of Lancashire, Holyhead (Irish), and Scotch, which are transferred at Tamworth to the 8.30 p.m. down postal express from Euston, due to arrive Tamworth at 10.40 and depart at 10.47, except the Irish mails. These are placed in the Post Office apparatus a quarter of a mile north of Tamworth station, and picked up by the 8.50 p.m. Euston to Holyhead. The return mail (2.25 a.m. ex Tamworth) also conveys mails and parcels post from Scotland to the East Coast, etc., by the 6.35 p.m. up postal express, Glasgow to Euston, due to arrive Tamworth at 1.30 a.m. and depart at 1.40.

Going back earlier than 1849, we are informed that in May of the year 1843 the Midland Counties Railway had a train running between Nottingham and Birmingham as under :—

Nottingham	..	dep.	9.40 p.m.
Derby ..	..	,,	11.15 ,,
Tamworth	..	,,	12.15 a.m.
Birmingham	..	arr.	1. 0 ,,
Birmingham	..	dep.	12.30 a.m.
Tamworth	..	,,	1.18 ,,
Derby ..	..	arr.	2.15 ,,
Nottingham	..	,,	6.55 ,,

with a connection by road coach between Lincoln and Nottingham.

A Notable 2-10-2 Locomotive.

IN sending the photograph of Boston and Maine Railway 2-10-2 locomotive No. 3006, reproduced herewith, Mr. J. Murdock, of Troy, N.Y., United States of America, mentions that 20 of these engines have been in service for two years on the Berkshire division, between Rotterdam Junction, N.Y., and East Deerfield, Mass., 107 miles, and have proved highly satisfactory for heavy freight service over a hilly division, a fact that the writer can vouch for through the experience of running them. The designers were limited to the permissible clearance through the Hoosac tunnel, which burrows through the mountain of that name for a distance of 4¾ miles at an altitude of 836 ft. above sea-level at the central shaft in the tunnel. The gradient from either portal to the central shaft is 1 in 200.

The overhead clearance in the tunnel is further limited as the overhead system is used in the electric operation of the zone between Hoosac tunnel station and North Adones, 7 miles, within which is the tunnel itself. Three-phase alternating current, generated at 11,000 volts, 25 cycles, and delivered to the electric locomotives at 2,200 volts is used. The electric engines are coupled on ahead of the steam engines, and both the train and steam engine are hauled through by them. They are each capable of hauling 2,000 tons through. It is necessary to employ two for all east-bound trains, as the tonnage rating from Mechanicville to the central shaft is 2,900 tons, whereas west-bound it is 1,950 tons, exclusive of weight of engine and tender. It is therefore 3,400 tons east-bound to East Deerfield and 3,100 tons west-bound to Mechanicville or Rotterdam Junction. The ruling grade east-bound is about 1 in 125 for the tonnage rating of 2,900 tons and 1 in 100 west-bound for the 1,950 tons rating for the steam locomotives.

These engines are equipped with the Duplex locomotive stoker, Hancock M. N. L. non-lifting injector, of a capacity of 5,000 gallons

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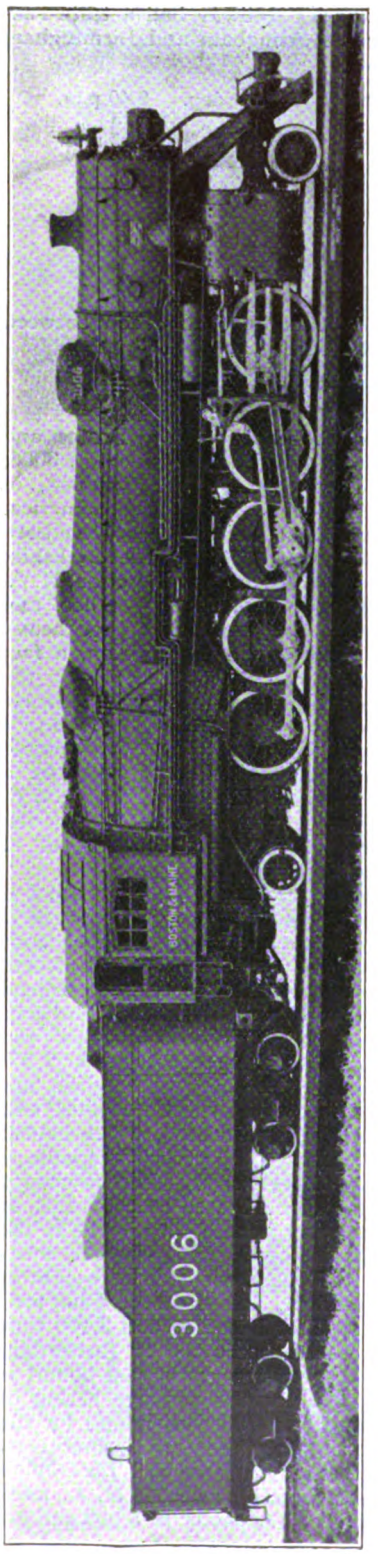

2-10-2 LOCOMOTIVE, BOSTON AND MAINE RAILWAY, U.S.A.

Built by the American Locomotive Company. Cylinders, 29 in. by 32 in. Coupled Wheels, 5 ft. 1 in. diam. Steam pressure, 190 lb. per sq. in. Heating surface, 4,801 sq. ft. Superheating surface, 1,167 sq. ft. Grate area, 80 sq. ft. Weight in working order, 159 tons; Engine and Tender 248 tons.

per hour, and Westinghouse cross-compound air compressor. The fire-box door, reversing gear, sanders and bell are operated by compressed air. The usual electric head, cab and rear lights are provided, steam-operated grate shakers for clearing or dumping the fire, and vestibule cab of the Canadian Pacific Railway type, are fitted. The tender is of the large type and carries 12,000 gallons of water and 16 tons of coal When not subject to delays, these engines cover the division in 5 to 6 hours with full tonnage. On the perishable or time freights, they have proved to be more economical proportionately than the hand-fired engines of the smaller sizes. They steam well, and keep the pointer on the 190 mark easily against the injector at full capacity of 5,000 gallons an hour. The cab fittings, in addition to power reversing gear, include a pyrometer and two reflex water gauges of the Ashcroft type, the right side one being tapped into a water column which is in turn tapped into the back head of boiler. The left side one is tapped directly into the boiler-head. The engines were built at the Schenectady works of the American Locomotive Company.

London Train Services which have disappeared.

ARISING out of Mr. Sekon's article under this title, published in the March and April numbers, and correspondence in connection therewith referred to in "Pertinent Paragraphs" in the May number, several contributors write to point out that it is hardly correct to consider a train service as having entirely disappeared if it remains in any form, even although greatly attenuated, while the further remarks published in the May number require modification in view of the fact that there is still one train each way, apart from the "Sunny South Special," between Willesden Junction and East Croydon. Thus, Mr. J. Wrottesley points out that existing time-tables include a train from Willesden Junction at 9.13 a.m. to East Croydon, via Clapham Junction, Crystal Palace, and Norwood Junction, returning from East Croydon at 11.13 a.m., while five other services are shown between Willesden Junction and Clapham Junction. The Rev. H. P. Hart, of Bury-St.-Edmunds, also writes to the same effect. In this connection he recalls the period when, as a boy, he lived at Streatham Hill. There were then five trains each way between Willesden Junction and Croydon, and "it was always considered a great treat to go in one of the white trains, as the Brighton Company's suburban coaches would not compare with them." He also suggests that the one train each way surviving is now the only regular steam passenger train running over the line

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between Balham Junction and Crystal Palace.

An Early Rail Motor Car.

WE reproduce on page 451 an old woodcut from *The Illustrated London News*, October 30, 1847. In the same issue there appeared a description of the engine from which the following is quoted :—

We give a sketch of the Lilliputian locomotive engine launched on the Eastern Counties line, on Saturday last. Though small in size, it will not be small in its results, as tending to show that, for many important purposes, speed may be attained with small weight. This little engine, in short, is to the usual ponderous locomotive what the racehourse is to the dray-horse. The origin of it, we understand was as follows : Mr. Samuel, the resident engineer of the line, having before his eyes the economising of the shareholders' and directors' pockets, had long viewed with uneasiness the sundry pounds per diem he was forced to expend in the use of large locomotives for the purpose of surveying the line. By his orders, Messrs. Adams, of Fair Field Works, constructed for him a manumotive machine, with 6 ft. driving wheels, with which a speed of 12 to 15½ miles per hour was attained. But this speed was insufficient ; and moreover, manual labour was found costly. Dissatisfied, but not disheartened, he began to think of the possibility of procuring a locomotive to travel some twenty miles per hour, and weigh only half-a-ton, so that on an emergency it might be lifted off the line. Messrs. Adams undertook to construct it, and, under the directions of Mr. Samuel, the working drawings were prepared. Everything was made as light as possible, and wooden wheels were used, the axles being only 6 ft. apart. On the first trial, it was found too small and short for steadiness. A new boiler was then put in, new iron wheels, and larger axles ; and the result has astonished all who predicted—first, that, though pretty and workmanlike, it would not go—secondly, that it was so light it would fly off the rails. It has, however, neither sinned in omission nor in commission. It has become not a " great fact," but a little fact pregnant with great consequences, and not least to those of the daily and weekly press, reducing their express expenses on the rail to one fourth the existing amount ; for, in this age, we cannot conceive that this will long remain a solitary engine, with the working expenses reduced to a few shillings per day.

The " Fairfield " Described.

THE following are the dimensions of the engine. The entire length of frame of engine and carriage, which is one, 12 ft. 6 in., on four wheels, 3 ft. 8 in. in diameter, the leading and driving wheels being of equal size ; and the width from centre to centre 9 ft., the wheels being outside all. The frame is divided in the middle by a bulk-head, into two compartments, the foremost containing the engine and machinery, and the latter the seats for the passengers. The boiler is a vertical one, on the American principle, consisting of 34 tubes, an inch and a quarter each in diameter, its diameter being 2 ft., and height 3 ft. 6 in. The flue beneath is 1 ft. from the rails, level with the floor, and the entire height of flue, boiler, and chimney, 7 ft. 6 in. The machinery, the working parts of which are all composed of steel, is enclosed in boxes on the sides of the compartment, consisting of two inside cylinders, 3 in. in diameter, with a 6-in. stroke, crank axle, link motion, with the usual reversing gear. The water tank is in the cross seat, against the division board of the two compartments, and will hold a sufficient supply for a run of from 18 to 20 miles. Coal is used, in consequence of its being so much easier of combustion than coke, in a furnace of such small dimensions. The passenger compartment is open, and resembles what is termed an inside Irish car, having a seat crosswise against the division board, and one on either side, which together will conveniently accommodate seven persons. The weight of the whole, which is suspended on spiral bearing springs, when in working order, exclusive of passengers, is about 22 cwt., and is able to travel at the rate of 40 miles an hour, the boiler having borne with ease a pressure of 200 to the square inch ; but it is not intended to drive her at this rate of speed or pressure on ordinary occasions.

In the trial trip Mr. Samuel, with this little engine, accomplished the journey from London to Cambridge (57½ miles) in 1¾ hours ; in more than one instance during which the speed attained was at the rate of 43 miles per hour.

Old Caledonian Railway Locomotives Still at Work.

UNDER this heading, in the January number, some remarks by Mr. J. D. Sherriff, of Arbroath, were quoted. In regard thereto Mr. Sherriff further mentions that several new 0-4-4 tanks are now appearing and they are practically the same as the first ones which were designed in 1899. The new ones have a few minor improvements such as Ross " pop " safety valves, but to all intents and purposes are the same as No. 452 which came to Arbroath in 1900.

Two Glasgow readers point out that several old Caledonian 0-4-2 locomotives are still engaged, though mostly for shunting

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duties, in the Glasgow district. They mention Nos. 165, 254, 278, 482, 486, 488, 1248, 1254, 1280, 1716 and 1718, pointing out that No. 278, at St. Rollox, was rebuilt in 1912, and No. 1280 rebuilt in 1901. These readers observed No. 482 at Braidwood. During the summer they noticed an old "Oban bogie," No. 1182, in the yard at Lockerbie.

Some Interesting Engines Still to be Seen.

MR. MALCOLM M. NIVEN also adds a few remarks concerning locomotives mentioned by Mr. Sherriff: "Regarding the 0-4-2 reboilered engines, No. 1275 is now on the duplicate list; she has still '275' on the tender and fore-end buffer-beam, but a plate states '1275' on the cab. Nos. 1275, 1264 and 1488 are station pilots; they draw the carriages out of the Central station to Gushetfaulds carriage lyes and sheds. Also they propel trains into the platforms and heat them prior to being put in charge of the train engines. At one time, such engines were used on mineral and goods trains. Mr. Ahrons alluded to this type in an article on the Caledonian engines in the RAILWAY MAGAZINE. Some of them still work mineral trains. One runs from Kilwinning to Irvine; No. 276 used to be on this duty. Regarding Ben Connor's 7-ft. engines, Mr. McIntosh rebuilt some of them. They were begun by Mr. Lambie. They ran Edinburgh trains from Glasgow (Central) in the late 'nineties and well into this century. No. 120 was for a long time on this work, and Nos. 117, 118 and 119 were to be seen on it often. A number of new 4-4-0 engines are being put into service. I saw No. 66, built by the North British Locomotive Company at their Hyde Park Works, quite recently, and she was on a Glenboig local from Buchanan Street. She has valves on top of cylinders and rocking sleeve motion and steam reversing gear. Regarding the old 7-ft. Connor which Mr. Sherriff mentions, No. 1035 when she came out first from Neilson's was at Perth. I have a photo of No. 33 before me just now, showing this engine with stove pipe chimney, dome on second ring of boiler barrel (near chimney end), Ramsbottom valves behind dome, just forward of the firebox casing. These engines had 17½ in. by 24 in. cylinders and 7 ft. 7 in. coupled wheels, not 7 ft. as Mr. Sherriff says. Nos. 33, 34 and 35 were well-known about the Perth end of the system. Many of these engines, if not all, had the Gooch valve gear."

The "Prairie" (2-6-2) Locomotive Type.

AN old-standing reader from overseas, Mr. W. T. Hoecker, of Galveston, Texas, U.S.A., writes as follows: "It afforded me great pleasure to see, on page 230 of your April 1922, issue, a description of a type of locomotive once popular in this country, but few examples of which have been constructed here since 1909. The 2-6-2 or 'Prairie' type would seem to be an admirable type for high-speed passenger trains, as it combines great boiler capacity for sustained efforts with adequate adhesive weight for starting purposes. It is interesting to compare the 'Prairie' with the 'Pacific' or 4-6-2 type, and it is somewhat difficult to understand why the former has been entirely superseded by the latter for express services. The 2-6-2 is undoubtedly slightly cheaper to construct than a 4-6-2 of equal power; the 2-6-2 can utilize the same proportion of total weight for adhesion, and as far as boiler capacity is concerned there is little to choose between the two. The four-wheeled bogie of the 'Pacific' necessitates a longer wheel-base and permits the use of slightly longer tubes, but this added length is at the front end of the boiler and has small evaporative value. It is said that the decline of the 'Prairie' is due to its lack of steadiness in running, and consequent risk of derailment at express speeds. This could be denied by reference to the satisfactory performance of numerous 2-6-2 engines in Italy, Austria, Russia, Serbia, Turkey, &c. That the 2-wheeled guiding truck is not unsafe at high speeds, may also be inferred from the use of 2-8-2 express engines in Italy, Austria, Saxony and Prussia. The recent successful performance of the 3-cylinder 2-6-0 engines of the Great Northern Railway, might be quoted as another instance. However this may be, it is a fact that all high-speed engines in this country are now constructed with 4-wheeled leading bogies, but it should not be forgotten that for several years prior to the advent of the 'Pacific' engines on the Lake Shore and Michigan Southern, the fastest trains of that line (among them the fastest long-distance trains in this country) were hauled by 2-6-2 engines.

"There is one statement in your article with which I beg to differ, namely: that Italy has probably had more 2-6-2 engines than any other country. If reference is made to tender engines only, then I will say that so far as I have been able to ascertain, about 300 of the 2-6-2 type have been built for the Italian Railways, while the railways of the United States have had at least 1,000 such engines in service. A great number of 'Prairie' engines were built for fast freight service, especially in the West. The Chicago, Burlington and Quincy had at least 200 of them, of several designs. There are 239 of them now running on the Santa Fe, 88 of which are balanced compounds weighing 116 English tons without tender."

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Mr. Hoecker gives details of various 2-6-2 locomotives, some intended for express passenger trains.

"Those constructed for goods service have now become too light to cope with the heavy main line trains in many instances. For this reason, the Northern Pacific Railway is reconstructing its 2-6-2 engines by lengthening the boiler and adding another pair of coupled wheels, making 2-8-2 or 'Mikado' engines of them."

Railway Distances.

THE construction of several expensive railway engineering works, such as long bridges and tunnels, would not have been undertaken by the railways concerned had they not obtained Parliamentary sanction to charge an increased mileage for the use of the tunnel or bridge, instead of a charge based on the actual length. The reason is obvious; the high cost of the work precludes a sufficient dividend being earned from fares and rates based on the actual mileage. Assuming the distance from A to B is 150 miles, but a bridge one mile long has to be passed over, and the railway has statutory powers to charge as if the bridge be four miles in length, then in public time tables, fare lists, &c., the distance from A to B will be given as 153 miles. This is largely done to avoid the answering of numerous enquiries that would be made concerning the apparent discrepancy between the fare or rate and the mileage.

It is not often that cases are to be found where the published mileage between two places is less than the actual distance by the usual route. This is so, however, between London and Manchester, by the late London and North Western Railway's usual route *via* Crewe. The London and North Western Railway public time table gives the distance between Euston and London Road, Manchester, as 183½ miles. So does *Bradshaw*. Both time tables give the distance between London and Crewe as 158 miles, *Bradshaw* gives the distance between Crewe and London Road as 30¾ miles, making the throughout distance, Euston to Manchester, *via* Crewe, 188¾ miles, or 5¼ miles more than usually stated. *Bradshaw* and the *A.B.C.* time tables give the distance by Midland route, the former as 189¼ miles to Victoria station, and 190 miles to Central station, Manchester, the latter as 189½ miles to both Central and Victoria. The late Midland Railway has a variety of routes between London and Manchester, but the distances given are presumably by the shortest route. From the above it is evident that there is actually little difference in the actual distances by the London Midland and Scottish Railway routes to Manchester, either *via* Crewe or Chinley.

How then did the late London and North Western Railway arrive at 183½ miles? This is the distance *via* Stoke, by which route there are three trains in each direction daily. It is made up as follows:—Euston to Colwich 127⅛ miles, Colwich over the late North Staffordshire Railway to Macclesfield 38¾ miles, and thence by the late London and North Western Railway to Manchester, London Road, 17½ miles; total 183⅜ miles. The route from Euston to Norton Bridge, thence by North Staffordshire Railway to Macclesfield and on to Manchester by the London and North Western Railway is 187 miles, or 1¾ miles shorter than throughout by the late London and North Western Railway's own route. Now that the North Staffordshire Railway is included in the same group company as the London and North Western Railway, the London Midland and Scottish Railway has a route of its own from Euston to London Road, Manchester, only 183¾ miles in length.

The Third Man on the Engine.

THE REV. W. MACHIN, Wesleyan Garrison Chapel at Lucknow, India, sends a cutting from the *Statesman* (Calcutta) in regard to the abolition of the third man, hitherto extensively carried on the footplate of locomotives of the Bengal-Nagpur Railway. It is pointed out that, from quite early days, it has been the custom to man locomotives with three persons—the driver, fireman, and a khalasi (a labourer a grade above a coolie). It is suggested that this custom arose out of the use of wood fuel in early days, though now coal is generally employed there is little work for the khalasi, except as a general assistant at watering stations, cleaning the ashpan, &c. Partly with a view to economy, and as there is so little for the khalasi to do, it is proposed to do away with the third man, providing instead additional assistance at watering stations and at the engine sheds, so that coal is properly trimmed on tenders before the engines leave. It is proposed to utilise the khalasis thus displaced at sheds, and ultimately to absorb them as regular firemen.

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MR. A. WINTER GRAY, who has been appointed Secretary of the Institute of Transport as from October 1, 1923, in succession to Mr. H. E. Blain, has been actively connected with the Institute from its inception. Born in 1875 and educated privately, he was subsequently articled to a London firm of land valuers and surveyors. From November, 1896, to February, 1917, he was employed in the Department of the Engineer and Surveyor of Lambeth, rising to the position of Chief Assistant. In March, 1917, he entered the service of the London Underground Railways as Assistant to Mr. H. E. Blain, with whom he was associated in the inauguration and administration of the London "Safety First" Council and of the British Industrial "Safety First" Association, serving as General Secretary of the latter. Mr. Winter Gray is a member of the Institution of Municipal and County Engineers.

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MR. H. A. BUTLER, recently appointed District Stores Superintendent, London and North Eastern Railway (Southern Area), commenced his service with the Great Northern Railway 27 years ago in the Stores Department. The whole of his railway career has been spent in that department, and, after obtaining an extremely wide experience in the various sections, he was appointed Assistant to the Stores Superintendent of the Great Northern Railway in 1920.

Photo.] [*Lafayette.*

MR. A. WINTER GRAY,

Appointed Secretary of the Institute of Transport as from October 1, 1923.

MR. J. STUDD, who has been made Assistant to Passenger Manager, London and North Eastern Railway (Southern Area), obtained considerable experience in the various sections of the Goods Manager's Department of the Great Eastern Railway before he was placed in charge of the Works Office in 1908. He remained in charge of the Works Office until April, 1915, when, on the amalgamation of the Goods Manager's and Superintendent's Departments and the creation of a Chief Traffic Manager's Department with two sections (Operating and Commercial) he was appointed Principal Assistant to the Commercial Superintendent. When in 1914 a committee was set up to investigate the constitution and working of the various departments of the Great Eastern Railway, Mr. Studd acted in the capacity of Secretary. He is a member of the Institute of Transport.

* * *

RECENT railway obituary includes Mr. John Jennings Brewer, Secretary of the Southern Railway, who died on the night of May 2, after a severe operation. Mr. Brewer, who until the formation of the Southern Railway, had been Secretary of the London, Brighton and South Coast Railway from January, 1898, was 68 years of age. The announcement of Mr. Brewer's death was received with great regret in many quarters.

* * *

OWING to failing health Sir W. Watson

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Rutherford, J.P., has resigned the Presidency of the Association of Superannuated Railway Staff and Major R. W. Barnett, M.P., has been appointed in his place. Mr. Patrick J. Ford, M.P., has become a Vice-President in place of Major Barnett.

* * *

Of great repute as a designer of small gauge locomotives, Mr. Henry Greenly, A.I.Loco.E., has been appointed Engineer of the Ravenglass and Eskdale Railway, the popular 15-in. gauge line in Cumberland. Mr. Greenly for some time has been acting in a consulting capacity, and lately has been resident at Ravenglass superintending the extension and additions to the line in connection with the considerable stone traffic recently obtained. He has designed a new 2-8-2 tender engine weighing 7 tons, and this is now on order, and when completed will be useful in hauling this additional freight traffic.

* * *

Transport development was the keynote of the speeches delivered at the fourth annual dinner of the Institute of Transport held at the Savoy Hotel, Strand, on May 3. The chair was occupied by the President, Sir Sam Fay; the company numbered about 300 and the assembly was a particularly brilliant one. The toast of the evening "The Institute and the Transport Industry" was proposed by Lieut.-Colonel Wilfred W. Ashley, M.P., Parliamentary Secretary to the Ministry of Transport, who emphasised the growing importance of civil aviation. He believed the development of civil aviation would be in the transportation first of letters, secondly of parcels and to a certain extent of passengers. The Government had a plan for starting a line which would proceed by Egypt and Mesopotamia to India, with the idea of extending it to Australia. On the general subject of transport Colonel Ashley said it had in its development provided cheaper, quicker and more comfortable travelling. It had an important part to play in the housing problem, as it is only by transporting the people away from the scene of their work, and housing them under proper conditions, that they would overcome the difficulties. Transport had opened up the beauties of the countryside to rich and poor alike.

Sir Sam Fay, in responding, remarked the great progress that is being made in electric traction, but stated that as there were 24,000 steam locomotives in Great Britain, the day of terminating steam traction was still far distant. Railways have much road competition to face, for a million and a quarter licenses for road motors were issued last year. There was never a time more necessary to use the microscope of scientific investigation of all methods of traction. Sir Sam concluded by announcing, to the accompaniment of loud cheers, that the Prince of Wales had consented to become Hon. President of the Institute.

To the toast "Our Guests," proposed in a clever speech by Mr. E. S. Shrapnell-Smith, the Hon. E. H. Walton, High Commissioner for South Africa responded, followed by Mr. William Whitelaw, Chairman, London and North Eastern Railway. Sir E. H. Walton spoke of the immense benefit derived in South Africa from railway development, while Mr. Whitelaw was much applauded for his sympathetic references to the many small railways that had disappeared by reason of the recently-introduced grouping system and likewise for the sound commonsense remarks he made in regard to examinations. The leading officers of the great groups could not, said Mr. Whitelaw, know all their subordinates and their qualifications, in the way that managers of the small railways did, and he hoped that if promotion ever came to depend upon examination, a man would be given credit for what he knew rather than be bowled out for what he did not know.

* * *

On Wednesday evening, May 9, a party of about 60 members (including three ladies) of the newly-formed Great Eastern Lecture and Debating Society visited the Spitalfields and Bishopsgate goods depôts of the Great Eastern section of the London and North Eastern Railway, by courtesy of Mr. W. Clow, Superintendent, and Mr. G. Marshall, Goods Manager, Southern Area. Dividing into parties, conducted by Mr. P. Syder, London District Commercial Superintendent, Mr. G. Keary, London District Operating Superintendent, Mr. G. Osman, Agent, and Mr. Logan, Stationmaster at Bethnal Green (in charge of operation at the depôts), and several inspectors, the visitors spent over two hours in various parts of these premises. The Spitalfields depôt deals chiefly with rougher consignments, and with complete truck loads and returned "empties." Associated with it are the coal yard, hoppers (into which coal is supplied from wagons overhead), the viaduct, coal hoist, and low-level sidings connecting with the East London Railway, granaries, etc. Most of the depôt is on two levels, with wagon hoists connecting. Bishopsgate goods depôt, virtually an extension of Spitalfields, is served by the same high-level lines, and has upper and lower tracks, but has associated with it upper and lower goods sheds, above which is an exceptionally

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spacious warehouse, having a superficial area of 101,000 sq. ft., served by well cranes and transverse overhead cranes, so that the greater part of its extensive area is thus accessible. Runways and gravity roller ways are also installed. The loading banks, fruit and fish platforms, egg and bacon banks, and numerous other departments received special attention, also the shipping or invoice office. Bishopsgate depôt usually deals with over 1,000 wagons in and out daily, the total tonnage handled being about 3,000. The clerical and wages staffs number about 2,000. At Spitalfields the work is more miscellaneous, considerable tonnage of coal and large quantities of "empties" being dealt with. Agricultural produce, etc., from the Continent, figures very prominently. On the conclusion of the visit, Mr. H. F. Hilton, Chairman of the Society, expressed the thanks of all concerned to Mr. Syder and Mr. Keary, together with others who had conducted them round. Mr. Syder replied, expressing the pleasure he and his colleagues had in doing what they could to render the visit interesting and instructive.

* * *

GREAT credit is due to the Dramatic Section of the T.O.T. Philharmonic Society for the excellent performances of the Gilbert and Sullivan comic opera, "Utopia, Limited," given at King's Hall, Covent Garden, on Thursday, Friday and Saturday, May 10, 11 and 12. This society is formed from the staff of London Underground Electric Railway and its allies. The Dramatic Section consists of about 60 members, and on this occasion each one of them is to be congratulated on tackling the opera in question and with such success. As at previous performances given by the society the opera was produced under the direction of Mr. Emil Hardy, and the musical side by the joint efforts of Mr. Ewart Beech, who attended to the choral work, and Mr. C. F. Lambert, for the orchestra. In witnessing the performance one quite forgot that the opera was being staged by amateurs so closely did each individual actor and actress approach the real thing. The singing and the dancing were excellent, the histrionic powers of the performers were most pronounced, while the deportment, particularly in the royal court scene, was all that could be desired. In short it was a "real good show."

"UTOPIA, LIMITED."

Dramatic Section of the T.O.T. Philharmonic Society at King's Hall, Covent Garden.

AT the Railway Club, 65, Belgrave Road, S.W.1. on April 13, Mr. W. H. Froud, B.Sc., read an instructive paper entitled "The Through Services between the London and South Western Railway and the North," a subject with which he is entirely conversant. Tracing the development of this traffic through a number of years, he elaborated his remarks with the assistance of some specially prepared maps, and a lengthy discussion followed, the evening closing with a vote of thanks to the lecturer.

* * *

AT a meeting of the London "Safety First" Council on April 30, it was announced that a scheme was in formation whereby railway employees, including clerical staffs, would be invited to contribute essays, not exceeding 1,000 words, on railway accident prevention. Prizes to the value

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of £10 would be offered. The offices of the council now are located at 119, Victoria Street, London, S.W.1.

* * *

ECONOMY in goods handling, and especially in transhipping, is a question constantly exercising the minds of railway administrators. A paper on this subject, entitled "The Influence of Transhipment on Rail-borne and Road Traffic, with Special Reference to the most Economical Methods of Labour-saving Appliances," was read on April 6 at a meeting of the Institute of Transport. It was of a composite character, Mr. J. Rostern, C.B.E., formerly Chief Goods Manager, Great Central Railway, dealing with "Operating," and Mr. C. Bentham, director, Henry Simon, Limited, Manchester, dealing with "Labour-saving Appliances." On Tuesday, April 17, Mr. H. E. Blain, C.B.E., gave a lecture to graduates and students entitled "The Prevention of Traffic Accidents." A large number of statistical tables relating to railway, tramway and road traffic accidents were included, but the main portion of the paper dealt with measures designed to reduce possibilities of accident. In regard to the "Underground" Railways the following items were illustrated and described: Dead man's handle, drivers' telephones, fog signal repeaters, air gates at stations, air-operated carriage doors, break and safety governor gear, and trip cock and train stop. In connection with lifts, the safety catch and governor were mentioned. Street accidents were then considered on a careful analytical basis, and various safety measures in connection with motor omnibuses and electric tramcars were described, the paper concluding with reference to the "Safety First" movement. The lecture was illustrated by lantern slides.

* * *

ENTITLED "Some Notes on Tramways, their scope and object, place in a comprehensive scheme of transport, and in municipal enterprise," a paper was read at the April meeting of the Metropolitan Graduate and Student Society of the Institute of Transport by Mr. E. W. Bayliss. He dealt with the subject historically and economically, the relation of tramways to standard railways, underground and tube lines, omnibuses, &c., then receiving attention.

* * *

FROM Crewe, Mr. C. Williams writes:—The remaining five 0–8–4 side-tank shunting engines, which complete the series referred to on page 343 of the April RAILWAY MAGAZINE, are now in hand at Crewe, Nos. 256, 731, 739, 1908 and 1956. These engines are fitted with "Pop" safety valves, thus differing from the preceding five engines, which have the usual Ramsbottom pattern. All are to be painted in the old London and North Western livery, and on the side tanks will appear the initials "L.M.S." in gold shaded with red.

Nos. 867 *Condor* and 964 *Bret Harte* ("Prince of Wales" Class) have been fitted with outside motion, but only the latter is in service as yet. It has been reported that No. 867 is to be re-named *Tishy*.

The four-cylinder "Claughton" class engine No. 110 has been named *Lady Godiva* and No. 150, *Illustrious*, while another "Claughton" (not yet allotted) is to be named *Croxteth*. A further selection of names for "Claughtons" and "Princes" has been made, and presumably naming is at last to be taken in hand with a view to completion as early as possible.

Nos. 990 *Bucephalus* and 804 *Amphion* ("Precursor" class ordinary) and Nos. 323 *Argus* and 688 *Hecate* ("Precursor" class superheater) have been rebuilt and assimilated to the "George the Fifth" class. Other conversions are: "B" class 0–8–0 compounds Nos. 2575, 2060, 1276, 1894, 1088, 813, 1040, 1248 and 2342, as well as "E" class 2–8–0 compounds Nos. 1886, 2169 and 1064, all of which have been simplified and superheated as 0–8–0 "G 1" class.

Several of the large passenger tanks have recently appeared newly-painted, and with the initials "L.M.S." on the tanks side. Those so far treated are Nos. 316 and 2384 (4–6–2's) and Nos. 1572 and 1305 (4–4–2's).

Recent withdrawals include *Engineer Northampton* and *Engineer Watford*, both of the old 6 ft. curved link class. They have been replaced by the 6 ft. straight link engines formerly numbered and named 468 *Wildfire* and 793 *Martin* respectively. No. 256 *President Washington* (6 ft. 6 in. straight link class) and No. 3256 (special tank class) have also been withdrawn.

The N.S. engine shed at Crewe has been closed, and the two passenger engines formerly stationed there have been transferred to Crewe North. Two Midland 2-4-0's Nos. 173 and 174 in charge of N.S. men are working regularly into Crewe, while two London and North Western "Princes" Nos. 2075 and 2392 have been transferred to Stoke for through working to Liverpool.

* * *

MR. G. CASS, of Scarborough, mentions that certain old North Eastern Railway locomotives bear the letters "N.E.R." instead of "L. & N.E.R." though otherwise

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re-lettered and numbered in the new style. He refers, however, to the appearance of other locomotives numbered and lettered according to the present style. Mr. Cass further mentions an interesting combination of engines noted at York. The first was the well known three-cylinder "compound," No. 1619, lettered and numbered as formerly, and it was followed by No. 1620 the first engine of class "M," painted and lettered in the new style.

* * *

THE first electric locomotive operated on the first tube railway in the world, made its last journey on April 25. No. 1 was designed and constructed by Messrs. Mather & Platt and commenced to run in daily service upon the City and South London Railway in 1890. Its last journey was from Stockwell Depôt to the Science Museum at South Kensington to take its place along with the *Rocket*, *Puffing Billy* and *Sans Pareil* and other obsolete railway relics of the past The City and South London line is the only tube line upon which electric locomotives are still in use and all these are due to disappear when the reconstructed line opens at the end of the present year.

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MR. STANLEY H. BURNS, Bushey, states that recently he has seen a Midland single engine, No. 600, used to haul the directors' saloon on the London and North Western section of the London Midland and Scottish Railway at Willesden, mentioning that the saloon now bears the letters "L.M.S." He also refers to the appearance of "Claughton" class locomotives in turn with "Princes" on goods trains to and from Broad Street.

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MR. ERIC CRICKMAY, writing from New York City, mentions that the Canadian Pacific Railway "Trans-Canada Limited" express resumed running on May 20, and that a new Canadian Pacific Railway express is to be introduced between Chicago and Vancouver, to be called "The Mountaineer." It is expected that this will begin running on June 10.

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WRITING from March a reader states that Great Northern locomotives, mostly of the ordinary 2-6-0 class, are now working vacuum-fitted express goods trains between Doncaster and Spitalfields, via Cambridge and March, for which purpose some of these engines are now stationed at Stratford and March (Whitemoor Loco.).

MR. W. E. BOYD, Edinburgh, mentions that a Caledonian three-cylinder 4-6-0 locomotive is now employed regularly on a Carlisle-Edinburgh goods turn. On the London and North Eastern Railway 10 further 0-6-2 tank engines have been received from Messrs. Stephenson & Co. at Darlington, their numbers being 519-528. The engines so far painted in the new London and North Eastern colours include 4-4-2 No. 876, *Waverley*, and 4-4-0 No. 895, *Rob Roy*, though several other engines are in the paint shops. 4-4-2 engine No. 510, *The Lord Provost*, has been fitted with water pick-up apparatus to enable it to run through on East Coast trains to and from Newcastle. 0-6-0 superheater goods engines of class "B" have had their pressures increased from 175 to 180 lb. per sq. in., and they are now class "S."

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SEVERAL correspondents have commented upon the fact that, on various sections of the new grouped systems, vehicles are to be seen painted in different colours and lettered with the names or initials of the new companies. These are all, we understand, prepared for consideration by the directors and chief officers, and, except where official statements have already been made, such instances do not necessarily indicate the practice which will eventually be adopted. Mr. H. C. Raindle remarks that the new vehicles placed in service on the London and South Western section of the Southern Railway, as mentioned in our May number, have now been formed into dining car sets by the addition of a restaurant car for use on the Bournemouth service.

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MR. F. E. HOLLAND, Wolverhampton, writes that the old Great Western 4-4-0 engines *Armstrong* and *Gooch* have recently been rebuilt at Swindon, and are now in service. The following four-cylinder 4-6-0 engines of the "Abbey" class are now attached to Stafford Road shed, Wolverhampton: Nos. 4066 to 4070, named, respectively, *Malvern Abbey*, *Tintern Abbey*, *Llanthony Abbey*, *Margam Abbey* and *Neath Abbey*.

* * *

MR. F. N. LANCE points out that the London, Brighton and South Coast memorial locomotive No. 333, *Remembrance*, illustrated in the May RAILWAY MAGAZINE, is painted grey, with a lining consisting of two white lines with black between. The lettering of the number is in white with thin black shading, as also the number on the sides of the bunker. This livery has been adopted, it

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is said, mainly with a view to obtaining good photographic results.

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AMONG the many activities of the Publicity Department, London Underground Electric Railways, is the provision of posters upon which school children may write essays. Entitled "A South Coast Landscape" a new one, a beautiful specimen of colour printing, on stout paper, has been issued recently. Its size is 72 in. × 40 in. A copy of the poster with descriptive wording is forwarded, post free on receipt of five shillings, by the Traffic Advertising Agent, Underground Railways, Electric Railway House, Broadway, Westminster, S.W. 1.

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CONSEQUENT upon the introduction of Summer Time in England on April 22, the Southern Railway (Brighton section) arranged for the night services to Paris and the Continent via Newhaven-Dieppe to leave Victoria (London, Brighton and South Coast) at 9.20 p.m., instead of 8.20 p.m. The departure of the night express from Paris

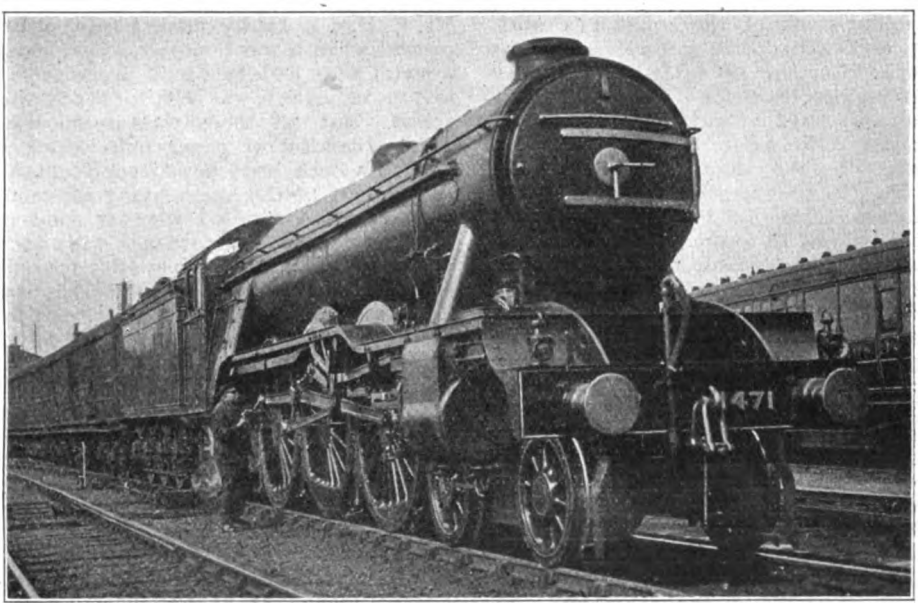

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*Chas. S. Lake.*

Great Northern 4-6-2 three-cylinder locomotive, No. 1471, at Peterborough.

CONSTRUCTION of the new offices adjoining Electric Railway House, is advancing at a rapid rate. They have an area of about 45,000 sq. ft. and are being constructed immediately over the tracks of the Metropolitan District Railway at St. James' Park station, and are built upon massive girders weighing, altogether, 400 tons. There will be six stories altogether, and when complete the building will accommodate a staff of approximately 400.

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As will be seen by our advertisement columns, two Continental tours for railway staff are being organised by Mr. H. Chandler, 140, Broomspring Lane, Sheffield, one to Brittany, July 8 to 14 (7 days), at a cost not exceeding £9, and another September 16 to 22 (7 days), the cost of which is not to exceed £10. Mr. Chandler, who is secretary to the Railway Deposit Friendly Society, will be pleased to furnish full details.

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CONSEQUENT upon the introduction of Summer Time in England on April 22, the Southern Railway (Brighton section) arranged for the night services to Paris and the Continent via Newhaven-Dieppe to leave Victoria (London, Brighton and South Coast) at 9.20 p.m., instead of 8.20 p.m. The departure of the night express from Paris (St. Lazare) to London via Dieppe was altered from 9.5 p.m. to 8.45 p.m. To avoid inconvenience the French State Railways accelerated the night boat train from Paris to Dieppe by 10 minutes, the train running via Pontoise instead of via Rouen, and the arrival in London (Victoria) remaining at 7.55 a.m. The Day Services from Victoria (London, Brighton and South Coast) at 10 a.m. and Paris (St. Lazare) at 10.35 a.m. have not been altered so far as leaving is concerned but owing to the difference between French and English times, the arrival in Paris from London, is 5.23 p.m. and the arrival in London (Victoria) from Paris is 7.40 p.m.

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IN connection with summer time the London and North Eastern Railway made arrangements whereby no alteration took place in the services from England via Harwich with the Hook of Holland and Antwerp in respect of the departure from England or the arrivals in England. The service via the Hook of Holland with North Germany is now normal, there being a through train with restaurant car between the Hook of Holland and Berlin via Osnabruck-Rheine and Hanover. From Osnabruck, passengers can reach Cologne, and at Rheine there are connections to Cassel, Frankfort, Nuremberg and Munich.

* * *

ORDERS have been placed by the London and North Eastern Railway for locomotives and rolling-stock at the company's workshops and with private builders :—Locomotives : Gorton, 10 4-6-0 express goods tender engines ; Stratford, 10 0-6-0 shunting engines, 10 0-6-2 suburban tank engines ; Doncaster, 15 2-8-0 three-cylinder coal engines, 10 0-6-0 shunting tank engines ; Cowlairs, 20 0-6-2 goods tank engines ; Darlington three 4-6-2 express passenger engines ; total, 78 locomotives. Carriages : York, 99 bogie vestibule and non-vestibule vehicles, 30 suburban carriages ; Stratford, 44 suburban carriages ; Doncaster, 64 suburban carriages ; Dukinfield, 23 suburban carriages, 3 bogie vans, 9 carriage trucks ; total, 272 vehicles. Sleeping cars : Doncaster, 2 twin sleeping cars ; York, 6 single sleeping cars. Wagons : Darlington, 4,000 12-ton open goods wagons, 255 cattle wagons, 250 fish wagons, 60 refrigerator wagons, 2,500 hopper wagons, 75 brake vans ; Doncaster, 1,000 12-ton open goods wagons, 40 brake vans ; Dukinfield, 750 12-ton open goods wagons, 750 12-ton mineral wagons, 20 well-glass wagons, 24 brake vans ; Inverurie, 200 12-ton open goods wagons, 200 covered goods wagons, 30 brake vans ; Cowlairs, 200 12-ton mineral wagons, 25 brake vans ; total wagons, 10,635.

* * *

FURTHER to the rolling-stock mentioned in the foregoing paragraph orders have been placed with outside firms as follows :—Metropolitan Railway Carriage & Finance Co., Ltd., Saltley, Birmingham : 800 wagons. Clayton Wagons, Ltd., Lincoln : 750 12-ton mineral wagons. Midland Railway Carriage and Wagon Co., Ltd., Washwood Heath : 750 12-ton mineral wagons and 500 12-ton open goods wagons. Charles Roberts & Co., Ltd., Horbury Junction, near Wakefield : 500 12-ton open goods wagons. Hamilton Wagon Co., Ltd. : 300 18-ton mineral wagons. Birmingham Railway Carriage and Wagon Company : 30 goods brake vans.

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A CONTRIBUTOR to the *Yorkshire Evening Post* referred, in a recent issue, to an " interesting find " made during the reconstruction of a portion of Morley railway tunnel. " About fifty yards from the Batley end there was a large foundation-stone which an old book by a local historian states was laid ' with festivity and display ' in 1846. It was known what this large block was, and as the tradition has been handed down through generations of railway officials that inside or behind it were official records, newspapers, and gold coins of the early nineteenth century, the District Engineer, Mr. E. H. d'E. Darby, made a point of being present when it was removed. Sure enough, a metal plate had been built inside the wall, and on removal it was seen to be covering a recess. But all there was inside was a sodden handful of paper pulp which had probably once been newspapers containing an account of the stone-laying ceremony." The question is raised whether coins ever were put inside in accordance with ancient custom, and, if so, how soon after the official ceremony they were extracted ! The writer quoted remarks, however, that " the brass plate itself is quite a treasure, for it contains the names of some of our greatest Yorkshire families. The inscription upon it is as follows : ' This, the first stone of the Morley Tunnel of the Leeds, Dewsbury and Manchester Railway, was laid by the Chairman, John Gott, Esquire, of Armley near Leeds, on Monday, the 23rd day of February, 1846. John Gott (Chairman), Christopher Beckett, Thos. Benyon, Joshua Brook, William Williams Brown, Thomas Cook, James Garth Marshall, D. W. Nell, Thomas Starley (Esquires, Directors), Thomas Grainger, Esquire (Engineer), Jones and Pickering (Contractors).' "

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A SERVICE of rail and motor launch circular tours in the Bristol Avon Valley—between Bristol, Bath and the adjoining stations, and Bradford-on-Avon was inaugurated by the Great Western Railway on May 12th.

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KENNINGTON station, City and South London Railway, will be closed on and from June 1. This is necessary to facilitate and expedite the reconstruction work which is proceeding between Morgate and Clapham Common. The issue of season tickets to and from Kennington has been discontinued.

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